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An Empirical Study of the Gordon-Shapiro Model and its Predictive Accuracy in Public Equity Markets

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1. Abstract & Key Words

Abstract

This empirical study investigates the predictive accuracy of the Gordon-Shapiro model by analysing six stable, dividend-paying firms across energy, infrastructure, consumer staples, consumer discretionary goods and pharmaceuticals over the sample period from 2008 to 2025. The study employs a multiple linear regression model to compare the model's intrinsic (equity) value estimates against actual market prices, while investigating the sensitivity of changes on key input variables, the long-term dividend growth rate (g) and the cost of equity (K_e). The study assesses whether the model's fundamental assumptions, perpetual dividend growth, stable cash flows, consistent payout policy and relatively stable cost of equity remain valid in modern financial markets, with constantly evolving dividend policy and alternative methods of shareholder compensation such as share repurchase programmes. The results of the study demonstrate that the Gordon-Shapiro model displays a reasonable level of accuracy in predicting the price of mature firms in regulated industries with stable dividend growth, payout and revenue streams. The analysis also uncovers sector-specific biases and reinforces the significance of proper assumptions and input estimations, especially for the dividend growth rate (g) which displays high sensitivity to minor changes. This research study contributes to the literature surrounding equity valuation by providing empirical evidence on the realistic limitations and appropriate scenarios for the application of the Gordon-Shapiro model under present market conditions.

Key Words

Gordon-Shapiro model | Dividend Discount Model (DDM) | Equity valuation | Predictive accuracy | Dividend policy | Cost of Equity | Long-term dividend growth rate | Regression analysis | Share repurchase programme | Multiple valuation | Comparable company analysis.

2. Introduction

The Gordon-Shapiro model, also known as the Dividend Discount Model (DDM), has had a major influence on equity valuation since its discovery in the 1950s. The model estimates a value of a company's stock based on the present value of its expected future dividend payments, assuming a constant growth rate in perpetuity. The model's practical application remains a subject of debate in modern financial markets, especially given the presence of alternative methods of wealth distribution to shareholders, everchanging dividend payout policy and the existence of share repurchase programmes.

The validity of the Gordon-Shapiro model relies on three fundamental assumptions: 1) perpetually constant dividend growth, 2) stable cost of equity, and 3) consistent dividend payout policy. However, contemporary market conditions dispute these assumptions. Companies increasingly utilise diverse capital allocation strategies, switching between dividends and share buybacks depending on macroeconomic conditions, tax considerations and capital structure objectives. In other cases, it has become increasingly more common for companies to reinvest profits in the hopes of providing a greater return to shareholders based solely on the premise of capital gains. Furthermore, the assumption relating to perpetual growth may not be realistic, as economic cycles change, regulatory pressures and the competitive landscape introduce variability in earnings potential, and as a direct result, dividend payout.

This empirical study aims to assess the practical credibility and predictive accuracy of the Gordon-Shapiro model by applying it to a restricted sample of publicly listed companies with a strong history of stable dividend payout. By comparing the model's predicted intrinsic values with actual market prices over the sample period of 2008 to 2025, this research seeks to quantify the model's accuracy across distinct sectors and market conditions. The study also seeks to identify the model's sensitivity to changes in key input variables and compare the model's performance with other common industry valuation methods. Unlike previous studies that test the model in isolation, this study specifically tests the impact of the $K_e - g$ spread as an indicator of model suitability across a sample spanning multiple industries.

2.1 Objectives

1. To assess the practical assumptions of the Gordon-Shapiro model, steady dividend growth, constant cost of equity and consistent policy of dividend payout and test their validity in the real market.

2. To empirically test the predictive accuracy of the Gordon–Shapiro model by comparing its estimated intrinsic values with actual market prices of selected publicly listed firms over a defined period.

3. To compare the model's intrinsic value estimates with that of other valuation models such as multiple analysis and market-based valuation metrics, including Comparable Company Analysis using the EV/EBITDA multiple, assessing quantitative and qualitative differences across multiple industries.

4. To perform sensitivity analysis on key input variables of the model, in particular dividend growth rate (g) and the cost of equity (K_e) and documenting the responsiveness of the model to changes in variable assumptions.

5. To identify and explore the practical limitations of the Gordon-Shapiro model when applied to current financial market conditions, including changes in dividend policy.

2.2 Index of Tables/Graphs

2.3 Methodology

This research study uses quantitative empirical analysis to evaluate the accuracy and practicality of the Gordon-Shapiro model in modern financial markets, applying the model to historical financial data from publicly listed companies, and comparing the results with alternative valuation methods. Furthermore, the empirical study analyses the feasibility of the model by investigating the assumptions that must hold true for the effective precision of the model. The dataset is made up of a selection of six publicly listed companies that fit the requirements of the Gordon-Shapiro model, from some of the major stock exchanges. The sample period for the regression model is restricted to 2008-2025 to ensure a balanced panel with complete beta estimates for all six companies. This study selects a specific variety of companies based on certain conditions from these exchanges and applies the model on an individual basis. The conditions selected are:

1) Industry maturity, defined as sectors with stable competition, strong recurring revenue streams and a strengthened market position with limited potential for disruptive innovation. Mature industries include utilities, consumer staples (established brands with defensive attributes), telecommunications and other infrastructure-intensive businesses with high barriers to entry, pharmaceuticals (high research and development costs creating barriers to entry). These industries generate lower volatility in earnings and cash flows when compared with high-growth or emerging industries.

2) Dividend growth stability, defined as consistent dividend payments with limited volatility on a yearly basis. Within the constraints of this study stability can be measured as no more than one year with negative dividend growth within the twenty-year sample period. Firms that meet this requirement demonstrate a commitment to stable dividend policy assumed by the Gordon-Shapiro model's constant growth requirement.

To calculate the current market price using the Gordon-Shapiro model, the following formula is applied, where the three key variables to be considered are: the value of next year's expected dividend per share (Div_1), the cost of equity (K_e) and forecasted dividend growth rate (g), estimated using the compound annual growth rate (CAGR) calculated using the last twenty years of dividend data available from each firm obtained using FactSet (*Figure 1.1)*.

$$P_0 = \frac{Div_1}{K_e - g}$$

The first parameter, Div_1, represents the cash dividend per share that investors can expect to receive in the next dividend period. This figure serves as the beginning of the perpetual cash flow stream in the Gordon-Shapiro valuation model. Div_1 is obtained by projecting the most recent dividend (Div_0), using the firm's historical long-term growth rate (g). This projection to the long-term estimated growth rate reflects a more forward-looking payout level rather than a purely historical metric. By adopting a forward-looking approach, the perpetuity assumption of the model is better reflected (Koller, Goedhart and Wessels, 2020).

The second parameter, g, indicates the constant long-term growth rate of dividends assumed by the Gordon-Shapiro model. In this study, g is estimated by the dividend Compound Annual Growth Rate (CAGR) over the twenty-year period for each firm. This approach helps dampen the effect of short-term dividend fluctuations and highlights the average pace at which dividends have grown over time. The constant geometric growth assumption enables the simplification of the infinite dividend series to the closed-form perpetuity formula (Gordon and Shapiro, 1956).

The third and final parameter to the model, K_e, reflects the required rate of return demanded by shareholders as compensation for the level of risk they assume by investing in the company's shares. To measure the cost of equity (K_e), the CAPM model is used. This model is a recognised method in the industry for cost of equity calculations. The CAPM model determines the risk of the particular asset based on its sensitivity to the market using a metric known as beta (β). By considering the risk-free rate (rf) and the beta multiplied by the market risk premium (rm – rf) an estimation to the cost of equity can be established (Berk and van Binsbergen, 2017). As a general rule the risk-free rate corresponds to the 10-year bond of that region, e.g. Eurozone region may use the 10-year German bond, whereas in the United States the 10-year US Treasury bond is typically selected (Damodaran, 2020). Additionally, for the model to function correctly, the cost of equity, must be greater than the growth rate in all observed cases ($K_e > g$). On occasion, the cost of equity parameter (K_e) is also referred to as the required rate of return (r).

$$\text{CAPM: } K_e = R_f + \beta * (R_m - R_f)$$

In order to test the predictive accuracy of the model a multiple linear regression is utilised in order to compare the results of the model to actual market prices. This approach allows for quantification of the predictive accuracy of the Gordon-Shapiro model by statistically measuring the difference between observed values and actual market prices during the defined period. The primary reason for implementing a multiple linear regression model is the ability to add control factors such as industry type or the size of the company to identify specific patterns that may explain any observed deviation from real market prices. The data analysis has been performed using excel, while the regression model has been built using R software, using relevant statistic packages to ensure accurate and flexible analysis of the data. Additionally, a sensitivity table in Microsoft Excel is used to measure the sensitivity of changes in the key input variables: dividend growth rate (g) and the cost of equity (K_e). This analysis also assists in selecting appropriate figures for application of the model.

3. Literature review

3.1 Impact of dividend policy on company valuation

It is often considered that dividend policy can have a significant impact on the value of a company. The literature on dividend policy and its impact on a firm's valuation challenges this idea. Modigliani & Miller argue that a firm's value does not consider the policy of dividends adopted by the company but rather the income generated by the firm's own assets (Miller and Modigliani, 1961). Further research on the subject validates this claim, stating that investors do not buy shares with the primary intention of receiving a dividend (Bon and Hartoko, 2022). The major issue with assuming that dividend policy does not affect the value of a company is that in perfect capital markets this holds true as dividend payout is more or less irrelevant to how the market prices a company, however in real world scenarios with taxes, transaction costs and asymmetry of information, dividends can have a marginal effect on the price of a company. While there can be a marginal effect, when compared with other factors such as profitability and leverage the effect of dividend policy is reduced, often making it more insignificant in the pricing of a company (Priya and Mohanasundari, 2016). Tax incentives may lead some investors to prefer capital gains, while income focused investors may favour dividends over capital gains, thereby influencing the demand of a company's stock, causing price fluctuations. By understanding the impact of dividend policy on firm valuation, the application of the Gordon-Shapiro model in real market conditions and testing the predictive accuracy of the model becomes clearer. While dividend policy can affect an investor's perceived risk of a stock and has the ability to cause minor price variations in the short-term, the evidence clearly shows that fundamental factors such as profitability, capital structure and the opportunities for investment account for a much greater proportion of the value of a company than dividend policy alone. In summary, dividend policy assumes a secondary role in determining the value of a company when compared to the fundamental factors aforementioned. This rationale explains why dividends can be treated as a channel of value distribution rather than the primary source of value creation within the firm (Goyal, 2019).

A series of studies focused on measuring the volatility of stock prices based on dividend policy concluded that stocks with a higher dividend yield and payout ratio are broadly associated with lower stock price volatility, this finding is consistent with the idea that dividends act as a signal of firm quality and stability. This conclusion also aligns with the assumption that the Gordon-Shapiro model performs best in predicting the price of stocks with stable, predictable dividend payouts (Hussainey, Oscar Mgbame and Chijoke-Mgbame, 2011). In emerging markets this assumption does not have the same significance. The Gordon-Shapiro model works best in mature markets where growth is steady, in emerging markets the relationship is negative or often insignificant. High dividend payouts restrict a firm's ability to invest, a critical requirement in emerging markets where growth has not been stabilised and opportunities for growth remain strong (Jabbouri, 2016). This restriction is particularly relevant for firms where retained earnings act as the primary driver in funding capital expenditure projects. Furthermore, companies with production-intensive operations face a significant problem: increased depreciation and amortisation expenses that significantly reduce earnings from an accounting perspective, hence skewing the dividend payout based on the reduced net income result. This constraint undermines the core stable, perpetual growth assumptions of the Gordon-Shapiro model as the long-term dividend growth rate (g) becomes unreliable due to the persistent deviation between cash flows generated by these firms and their respective reported earnings (Aivazian, Booth and Cleary, 2003). This literature review directly impacts the selection criteria employed in section 4.2, where dividend policy consistency is treated as a requirement rather than an assumption of the model.

3.2 Applications of the Gordon-Shapiro model

The Gordon-Shapiro model builds on the dividend discount model first established by John Burr Williams in the 1930s. The updated model from Myron J. Gordon and Eli Shapiro introduced the constant growth rate of dividends to the model, allowing for a wider application of the model as a valuation metric. The model values the firm based on the present value of expected future dividends and serves as a method to value the equity portion of a company, also known as the market capitalisation of a business (Gordon and Shapiro, 1956). The three primary functions of the Gordon-Shapiro model are as follows:

1) Investment analysis: The model can be used to determine whether a stock's price is trading over, or under-valued compared to its market price. The comparison between the output from the model and the current market price serves as an indicator as to whether the stock is trading at an attractive price for potential investors.

2) Intrinsic value estimation: The Gordon-Shapiro model can be used as an estimation to the intrinsic equity value of the company, the share of the company attributable to equity holders.

3) Terminal value calculation: The Gordon-Shapiro model or "Gordon growth model" as it is commonly referred to can be used to calculate the terminal value of future cash flows, which represents the stage of stable growth in a DCF (Discounted Cash Flow). The accuracy of the underlying assumptions is critical as the terminal value often accounts for the greatest portion of the value.

The Gordon-Shapiro model is a cornerstone of corporate finance, in particular with equity valuation. The model is particularly common in the utility and financial sector due to regulated profits and stable dividend payouts. These conditions make the use of the model more accurate in predicting the fair value of a company.

Previous studies show that the model can be applied to approximate fair values for mature, stable firms with a sustainable earnings expectation, however its accuracy declines in markets or companies with erratic dividend policy or where the dividend payout policy does not reflect the long-term earning potential of the firm. In the current market dynamic, the core assumptions of the model are often violated, especially for newer, fast-growing industries and firms that don't pay dividends or in firms where dividend growth exceeds earnings sustainability. Empirical studies demonstrate that the model should be used with caution, often complementing it with alternative models or further empirical validation for high-growth stocks (Avanzi, Tu and Wong, 2016).

3.3 *Mathematical assumptions and foundations*

The Gordon-Shapiro model is fundamentally a perpetuity model that assumes that dividend payments continue indefinitely into the future. This differentiates the model from annuity models commonly used in financial mathematics, that assume cash flows terminate after a finite number of periods. The perpetuity assumption can be expressed as: $P_0 = \sum_{t=1}^{\infty} \frac{Div_t}{(1+K_e)^t}$, where dividends extend to infinity (∞).

The Gordon-Shapiro model assumes constant geometric growth of dividends; each dividend grows by a fixed percentage (g) relative to the previous period $Div_t = Div_0 \times (1+g)^t$.

This differentiates the model from arithmetic growth annuities, where dividends would increase by a constant absolute amount each period, for example: $Div_t = Div_0 + (t \times b)$. Where b represents a constant monetary increase.

The geometric growth assumption simplifies the infinite time series into the Gordon-Shapiro formula: $P_0 = \frac{Div_1}{K_e - g}$, which as stated before is only valid when $K_e > g$ and the growth rate remains constant into perpetuity.

Limitations of the perpetuity and constant growth assumptions:

1. **Perpetuity assumption:** No company exists forever in reality, firms are acquired, go bankrupt or cease dividend payments. The Gordon-Shapiro model assumes the company continues operating

forever with consistent dividend payments.

2. **Constant geometric growth:** The reality is that dividend growth rarely grows at a constant predetermined rate. Companies experience setbacks, strategic changes and periods of economic downturn.
3. **Sensitive to change:** Due to its heavy reliance on growth (g) and cost of equity (K_e) assumptions, small changes in these metrics can have a significant impact on the output of the model and can often cause unrealistic valuations if assumptions are not accurate.

With these limitations in mind, this empirical study focuses on mature, stable firms in regulated industries where the perpetual growth rate assumption is most likely to be close to reality (Reis and Augusto, 2019).

3.4 Modern dividend policy & alternative methods of cash distribution to shareholders

Regular cash dividends are the most widely adopted form of payout to shareholders. This is because they are often interpreted as a sign of sustainable growth and earnings. However, the most common alternative method of distributing cash to shareholders is through share repurchase programmes. These programmes can be a replacement for traditional dividends in the situation where a company feels its stock price is undervalued or when reevaluating its capital structure. Share-repurchase schemes usually entail offering a payout to existing shareholders at the current market price of the stock. Recent examples of share-repurchase programmes include those of Axa and PayPal. Axa announced a €3.8 billion buyback programme on 1 July 2025 following BNP Paribas' acquisition of Axa's investment services provider, Axa Investment Managers ("Axa IM"). This programme commenced on July 2, 2025, with the latest date for shares to be bought back on February 26, 2026. While this share buyback scheme does not directly distribute cash to shareholders its main objective is to offset the earnings dilution from the sale of Axa IM to BNP Paribas, and to improve Earnings Per Share (EPS) metrics. Axa employs share-repurchase programmes as a core element in its capital management and shareholder compensation policy. Axa's engagement represents a shift towards comprehensive total shareholder returns, tactically utilising repurchases to return excess capital, manage the balance sheet and drive value creation on a per-share level in parallel with regular dividend payouts (*Execution of a share repurchase agreement of up to Euro 3.8 billion following the sale of AXA IM*, 2025).

PayPal is another example of a company that has used sizable share repurchase programmes as part of its capital management. PayPal's board approved a new 15 billion dollar repurchase programme in February 2025, building upon the previous programme from June 2022, which brings the total capacity to nearly 20 billion dollars. In 2024 PayPal deployed around 6 billion dollars to buy around 92 million shares, contributing to an estimated 17% increase in EPS. PayPal's management have expressed that the buybacks are a means of returning excess free cash flow and improving their overall capital efficiency by reducing the number of shares outstanding over time and as a result supporting per-share value creation (*PayPal Board Approves New $15 Billion Stock Buyback*, 2025).

The following example explains the mechanics of a share buyback programme: Imagine at the time of the share buyback PayPal has a market value of €184 billion and 184 million shares outstanding, implying a share price of €1000 per share. If the company repurchases and cancels 50% of its shares (92 million), the total market value may remain at €184 billion, but it is now spread over just 92 million shares. In this example, the price per share doubles to €2000 per share (€184 billion market value / 92 million shares), while each remaining share represents a larger ownership stake and claim on future earnings.

The repurchased shares can be either cancelled or kept within the company as treasury stock. Upon repurchasing the shares, they no longer carry dividends or voting rights. Share-repurchase programmes are often closely linked with dividends as a way of distributing cash to shareholders. The regulatory landscape tends to be more critical in Europe than in other parts of the world, with regulators looking to ensure that repurchase programmes are in the best interests of all shareholders, including the minority shareholder. In the eyes of European regulators, all shareholders should benefit in an equal way, regardless of their shareholding within the company. The US market is traditionally viewed as more favourable, resulting in more frequent employment of repurchase programmes (Garcia de Enterria, 2024).

European companies typically engage in share buyback schemes to "perform roles that cannot be performed through dividend payments" (Dhanani, 2016). Key reasons to engage in these programmes include management of Earnings Per Share (EPS), gearing ratios and the undervaluation hypothesis. If a company feels as though the price of its stock is undervalued, they may decide to complete a share buyback with the expectation of the price rising in the future and making a profit on this gain. Share repurchases are highly regulated in Europe as they were often considered a form of market manipulation.

Another method of cash distribution to shareholders is through special dividends or extraordinary dividends that may arise from the sale of assets or significant cash surpluses. These are less common than traditional dividends, hence the name extraordinary dividends. These dividends allow the company to return excess cash to shareholders while maintaining the stability of their regular dividend policy (Eryomin, Likhacheva and Chernikova, 2021).

From a valuation point of view, recent literature suggests that the single most important factor in dividend policy is the overall consistency between payouts and firm strategy. In order to maximise shareholder value, dividend policy should be aligned with the strategic objectives of the firm. Share repurchases and dividends should be treated as a unified payout policy rather than isolated decisions. Evidence from previous studies highlights that firms should maintain a consistent dividend payout policy and use share repurchases and extraordinary dividends as flexible tools to redistribute excess cash alongside their core commitment (Weigand and Kent Baker, 2009).

4. Empirical analysis

4.1 Exploratory Data Analysis

The regression model consists of 107 observations for six large, dividend-paying companies: Acciona, Coca-Cola, Enagás, Nestlé, Nike and Roche. The sample period runs from 2008-2025 and all six firms are listed on major developed market stock exchanges. Before proceeding to the regression analysis, *Table 1.1* displays a summary of the key variables in the model across the full sample of 107 observations. The variables highlighted include actual market price, Gordon-Shapiro model predicted price, beta, Return on Equity (ROE), dividend payout ratio, long-term dividend growth rate (g) and the cost of equity (K_e).

Variable	Mean	Std. Dev	Min	Max
Actual Price	93.58	86.46	11.78	408.80
GS Model Price	73.95	95.80	1.99	328.92
Beta	0.77	0.23	0.331	1.73
ROE (%)	25.33	18.59	(-46.63)	102.95
Payout Ratio (%)	61.50	49.33	0.00	512.82
Dividend Growth Rate, g (%)	2.42	1.67	0.00	7.35
Cost of Equity, K_e (%)	6.04	2.16	2.68	16.86

Table 1.1 – Descriptive Statistics

The mean Gordon-Shapiro model price of 73.95 compared to the actual mean price of 93.58 indicates that the model has a slight undervaluation bias. However, as explained by the regression analysis, the relationship is strongly influenced by factors on an individual firm basis.

The beta values range from 0.331 (Enagás, demonstrating the effect of a highly regulated Spanish energy market) to 1.73 (Acciona in 2008, caused by a period of high volatility and increased leverage as a result of the financial crisis). The mean of 0.77 is consistent with expectations given the more defensive nature of the sample companies selected. Return on Equity (ROE) marks the most considerable variation amongst the dataset variables, the minimum of (-46.63%) for Acciona in 2013 due to significant impairment expenses during the year (Acciona, 2014). The maximum of 102.95% for Roche in 2010 reflects the pharmaceutical industry's high returns relative to the equity base. The payout ratio ranges from 0% to 512.82%, with the upper bound relating to an anomaly from Coca-Cola in 2017, where a one-time "repatriation tax" was imposed on all offshore earnings that had not been domiciled previously in the US. This collapse of Earnings Per Share (EPS) due to the non-recurring expense paired with the continued dividend growth is what caused the extreme payout ratio (*The Coca-Cola Company Reports Strong Operating Results for Fourth Quarter and Full Year 2017; Achieves or Exceeds the Company's Full Year Guidance*, 2018). In order to contain the effects of extreme outliers in the payout ratio, growth rate was floored to 0 for companies that exhibited a payout ratio > 100%. The long-term dividend growth rate ranges between 0% and 7.35%, reflecting the consistent dividend growth requirement of the Gordon-Shapiro model.

An explanation of each of the variables follows:

Dividend (*Div_1*)	The core prediction variable within the Gordon-Shapiro model
Beta ($\boldsymbol{\beta}$)	Essential for cost of equity calculation (CAPM) and to investigate whether systematic risk can negatively affect price.
Risk-Free Rate	Used in cost of equity calculation, theoretical return based on an investment with zero risk. Approximated as the yield on stable 10-year government bonds.
Market Risk Premium	Explains the different risk profiles for each country and explains how the broader market appetite for risk affects individual stock prices
Market Cap	Measures the impact of the size of the firm on market price beyond only dividends.
Industry	Serves solely as a qualitative factor to further explain differences between sectors and prediction variation within the model.
ROE (Return on Equity)	Serves as a key factor in the fundamental growth formula implemented for estimating the long-term dividend growth rate.
Payout Ratio	Serves as a proxy for calculating the retention rate (1 – Payout Ratio), required for the fundamental growth rate formula.
Long-Term Dividend Growth Rate	Estimated rate at which dividends grow in perpetuity.
Cost of Equity	Reflects the required rate of return demanded by shareholders as compensation for the level of risk they assume by investing in the company's shares.

Rather than using a single static beta over the entire sample period, a 5-year rolling beta is employed to ensure an accurate beta across all years of the study. This rolling beta is estimated using the previous 60 monthly return data points prior to that year-end date. For the next year-end, the time frame rolls forward by 12 months to accurately capture the beta for the next observation. This results in a unique beta for each firm in each given year. This approach to the beta calculation is more appropriate than the static beta because systematic risk varies over time. The recalculation of beta each year using the previous 60 months of data ensures that the cost of equity estimations used in the Gordon-Shapiro model are relevant to the specific risk environment experienced at that point in time, providing a more theoretically sound input to the model. The following indexes were used as reference in the beta calculation for each of the sample firms: Acciona – IBEX, Coca-Cola – S&P500, Enagás – IBEX, Nestlé – SSMI, Nike – S&P500 and Roche – SSMI.

The risk-free rate, respective 10-year bond rate is obtained using data from FRED, a database from the Federal Reserve Bank of St. Louis (*Market Yield on U.S. Treasury Securities at 10-Year Constant Maturity, Quoted on an Investment Basis*, 2026). Coca-Cola and Nike are paired with the US treasury 10-year bond yield, while Roche and Nestlé are paired with the Swiss 10-year government bond yield. The Spanish companies: Acciona and Enagás are benchmarked against the European Union benchmark, the German 10-year bund yield.

In order to calculate the market risk premium, Damodaran's implied Equity Research Premium (ERP) is utilised (Damodaran, 2026). In the case of Coca-Cola and Nike, the market risk premium corresponds to the base ERP for the US as stated by research from Damodaran. The base ERP (US) is treated as the global premium that investors demand for holding equities over the risk-free rate in a developed market. The base ERP fluctuates each year as a result of market prices, valuations and interest rates (Damodaran, 2026). For the other sample companies from Spain and Switzerland the base US ERP is applied with a fixed adjustment for the country risk premium. This country risk premium is the extra return demanded for investing in a country due to political risk, institutional stability and most notably, sovereign creditworthiness. It is reasonable to assume a fixed market premium adjustment for this study as all observable economies are stable, investment-grade economies where the country risk premium remains relatively stable over time. For Swiss companies: Roche and Nestlé, the country risk premium adjustment is very marginal due to their (AAA) sovereign credit rating. With this in mind the additional country risk premium adjustment for the purpose of this study is 0%, in alignment with research from Damodaran. For Acciona and Enagás, Spain's country risk premium has been calculated at 1.55% partly due to the country's slightly lower (A) credit rating and a lower overall perceived economic stability in comparison with Switzerland (Damodaran, 2020).

4.2 Selection of Companies

For the empirical analysis stage, the selection of companies will focus on large, mature firms with a solid dividend yield and relatively stable payout history. The firms selected mainly consist of companies in highly regulated and defensive sectors such as utilities, communications and large financial institutions. Furthermore, the selection criteria for companies to be included in the analysis is as follows:

- Listed for a continuous period (newly listed companies, listed <10 years) should be excluded from the dataset to ensure reliability over an extended period of time.
- Dividend payout at regular intervals with relatively stable growth.
- Stable cash flows (industrials, utilities, telecoms, financials etc.)
- Mid to large cap to avoid minor price disturbances.

These restrictions align closely with the assumptions of the Gordon-Shapiro model allowing for a seamless integration for the empirical analysis stage. In this research paper the financial data acquired for the empirical analysis stage will be primarily obtained from FactSet, a reputable third-party financial database.

The performance of the empirical analysis depends on a sample of listed firms that fulfil the characteristics of the Gordon-Shapiro model at a reasonable level. The selection process is a structured sequence of steps designed to identify mature firms with stable dividend policy and reliable market data to carry out the analysis. The structure of the sequence is designed to allow for comparison of the predictive accuracy across a variety of firms from different sectors that share similar dividend policy and generate stable cash flows.

Stage 1: Initial Selection

The starting point for the selection process focuses on large and mid-capitalisation companies listed on the major stock exchanges. By focusing on mid and large-cap companies, the high level of liquidity ensures that actual prices reflect the perceived value of the stock by investors. By excluding smaller-cap firms, the data gathered is sufficiently strong to provide accurate comparisons across firms and industries (Sondakh, 2019).

Stage 2: Sector Screening

From here the criteria can be applied further to narrow down the available options to companies that belong to the specified sectors mentioned under the selection criteria. The selection of sectors such as utilities, media, industrials and large financial institutions is most appropriate for analysis as there are strict regulations in place. Revenue generation tends to be fairly constant which allows for predictability of dividends and stable recurring revenue (Sedzro, 2010).

Stage 3: Dividend Policy

The next stage of the process refines the sample to companies that have a strong history of dividend payouts over a period of at least 10 years. To ensure the best results, this study selects 20 years of dividend history from each of the companies. Additionally, regularity of dividend payments allows for the estimation of a long-term growth rate to be used in the Gordon-Shapiro model calculations. By excluding irregular, extraordinary dividends the payout over time becomes more stable and realistic to estimate the growth rate. These conditions also ensure that firms with high growth and non-dividend paying firms are excluded from the selection process.

Firm	**Ticker Symbol**	**Industry**	**Years of Data**	**Avg. Annual Dividend Growth**	**Dividend CAGR**
Acciona	ANA	Infrastructure (Spain)	20	10.4%	8.4%
Nestlé	NESN	Consumer Staples (Switzerland)	20	6.8%	6.3%
Enagás	ENG	Energy (Spain)	20	5.7%	4.4%
Coca-Cola	KO	Consumer Staples (US)	20	6.5%	6.1%

Roche	RO	Pharmaceuticals (Switzerland)	20	6%	5.4%
Nike	NKE	Consumer Discretionary (US)	20	13.1%	12%

Table 1.2 – Sample Breakdown

Stage 4: Final Selection & Grouping

After applying all of the filters, the final sample consists of six dividend-paying firms observed over twenty years (2005-2025). Furthermore, the companies have been strategically selected from a number of industries to reflect the fit to the model's assumptions and to test the model's accuracy across diverse yet stable industry profiles. This grouping also allows for further analysis and comparison to reveal insights around industry dynamics. This selection allows for an investigation into whether the predictive accuracy of the model varies with sector characteristics, business model or dividend specific factors. The final selection also consists of a variety of companies from Spain, Switzerland and the US in order to gain an insight into dividend policy across distinct geographic areas.

The CAGR value for each firm represents the model's required constant geometric growth assumption, while the average annual dividend growth highlights the year-over-year change (standard arithmetic mean).

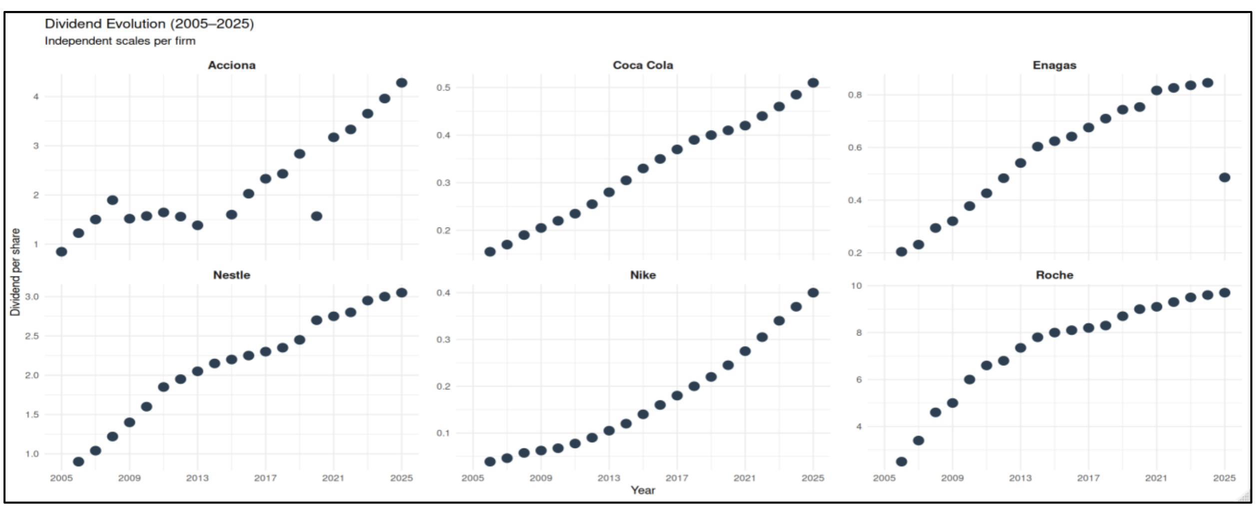

Figure 1.1 – Dividend per share evolution by firm (2005-2025)

Figure 1.1 presents the Dividend Per Share (DPS) evolution over the last twenty years for the six firms selected for analysis: Acciona, Coca-Cola, Enagás, Nestlé, Nike and Roche over the 2005-2025 period. Each of the six boxes displays annual dividend payments per firm, enabling clear identification of growth trends. Acciona is the only firm to have its 2005 dividend payment selected. This is due to the missing observation in 2014, where no dividend payment was made to Acciona shareholders. The independent scaling approach allows for clear visualisation despite currency differences and the high CHF- denominated dividends from Roche. With the exception of the outliers observed in the Acciona and Enagás datasets, the six companies selected meet the criteria for the Gordon-Shapiro model in terms of steady dividend growth.

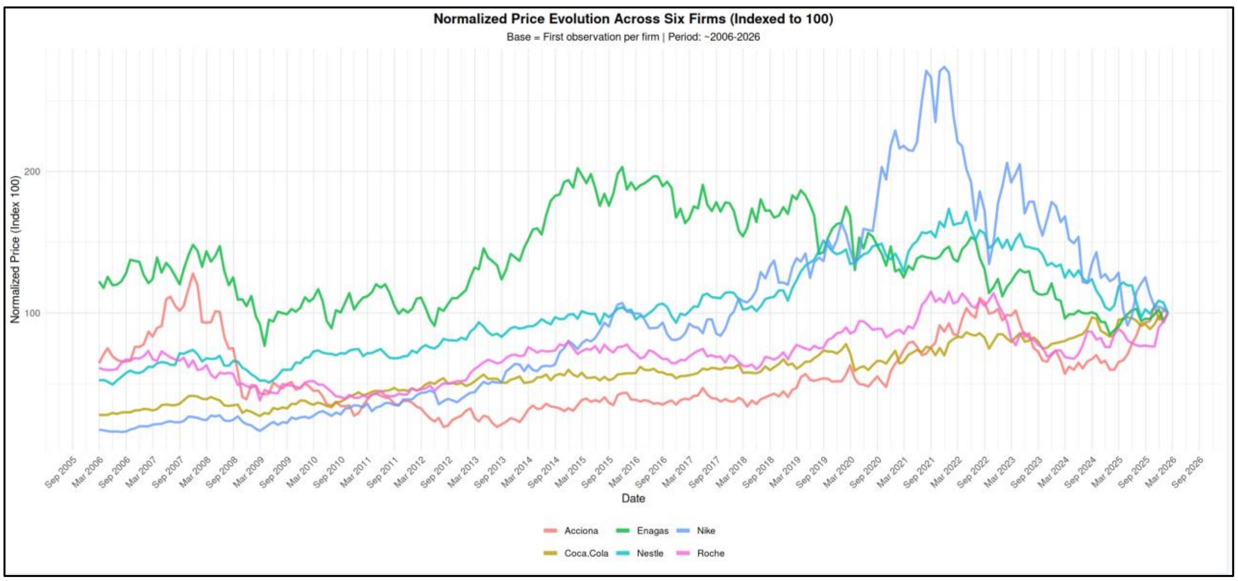

Figure 1.2 – Price evolution by firm (2006-2026)

Figure 1.2 highlights the relative performance of each of the selected firms over the sample period. The stock prices have been normalised to an index of 100 to provide a clear comparison despite varying price levels (Roche ~ €365 vs Enagás ~ €14). This normalisation technique computes each price using the following formula: $\boldsymbol{\frac{P_t}{P_0}}$ **x 100**, where P_t is the price at time t and P_0 is the starting price for that firm. The normalisation ensures that absolute price differences don't hide patterns in price evolution.

4.3 Regression analysis

To empirically test the predictive accuracy of the Gordon-Shapiro model, this study uses two separate multiple linear regression models that regress actual year-end market prices against the model's predicted intrinsic values across the full sample of 107 firm-year observations within the sample period (2008-2025).

The first regression model takes the form:

$$\boldsymbol{Actual\ Price_{it} = \alpha + \beta_1 \cdot GS\ Price_{it} + \varepsilon_{it}}$$

Where Actual Price_{it} is the year-end market price for company i in year t and GS Price_{it} is the Gordon-Shapiro price estimate for the same firm-year. A perfect model would imply $\alpha = 0$ and $\beta_1 = 1$, meaning the Gordon-Shapiro predicted price gives exactly the same result as the actual market price. This hypothesis is properly tested using a Wald test. Model 1 therefore serves as a direct test of the Gordon-Shapiro model's unbiasedness.

The second regression model expands on the previous model by adding additional control variables and company fixed effects:

$$\boldsymbol{Actual\ Price_{it} = \alpha + \beta_1 \cdot GS\ Price_{it} + \beta_2 \cdot Beta_{it} + \beta_3 \cdot ROE_{it} + \beta_4 \cdot Payout\ Ratio_{it} + \sum_i \gamma i \cdot Company_i + \varepsilon_{it}}$$

The company fixed effects γi control for firm-specific characteristics such as size, currency denomination and market listing that may explain systematic deviations in absolute price levels across firms. The additional regressors, Beta, ROE, and Payout Ratio are included to check whether any variation in market prices, explained by the Gordon-Shapiro model is down to the model's underlying inputs. ROE and payout ratio are already included within the growth rate, *g* calculation. Their inclusion in this model serves purely as an omitted variable bias check rather than a test of their effect on the accuracy of the model.

The purpose of the second regression model is to test if the undervaluation bias identified in the first model is a genuine structural limitation of the Gordon-Shapiro model, or whether the bias is driven by firm-specific differences that are unrelated to the model's predictive accuracy. The first regression model estimates a sole relationship between all six observed firms simultaneously, treating the large deviations between companies as variation that the model should explain. For example, Roche trading at over €300 compared to Enagás at below €15. These differences reflect characteristics unique to each firm such as shares outstanding, currency denomination, and specific market conditions instead of any possible valuation conclusion. The introduction of company fixed effects, γi, absorbs the structural differences between firms, allowing for isolation of the relationship between Gordon-Shapiro predictions for individual firms and the actual market price over the sample period. If the GS price coefficient ($\hat{\beta}_1$) converges towards 1.0, this would confirm that the bias observed in the first regression model is down to structural differences between firms rather than a structural failure in the model to accurately predict price movements within individual firms over time.

This method allows for clear quantification regarding prediction errors, capturing both the direction and magnitude of any systematic prediction error within the sample. This regression model incorporates the following control variables: beta (β), Return on Equity (ROE), the dividend payout ratio alongside other variables to identify systematic deviations and reveal patterns tied to sector-specific factors or characteristics on an individual firm basis. While serving as the key components in the calculation of the long-term dividend growth rate through the fundamental growth formula, the ROE and dividend payout ratio also act to reflect firm profitability and overall dividend policy, both factors being identified as playing a minor role in determining equity value (Priya and Mohanasundari, 2016). This approach aligns with the model's assumptions of stable dividend growth in mature firms.

Interpretation of results

In model 1, $\hat{\beta}_1 = 0.835$ ($p < 0.01$). This confirms a strong, statistically significant positive relationship between the Gordon-Shapiro predicted price and the actual market price.

In model 2 (with company controls and additional regressors), $\hat{\beta}_1$ increases to 0.990 ($p < 0.01$). This is a significant improvement and is very close to 1.0. This explains that over time, the GS model is an almost perfectly proportional predictor of actual market price. The bias present in model 1 is therefore driven by differences between firms, scale, currency, not by the model's fundamental inaccuracy.

The regression model assesses overall fit through the coefficient of R^2 and adjusted R^2, which penalises the addition of weak prediction variables:

	Model 1	**Model 2**
R^2	0.849	0.903
Adjusted R^2	0.847	0.894

Table 1.3 – Regression Results

The R^2 of 0.849 in model 1 is solid. It shows that the GS model alone explains 84.9% of the variation in actual market prices. Model 2 improves this result to 90.3%, with the improvement mainly down to company fixed effects (currency, scale, market listing) rather than the additional regressors, which are not statistically significant at the 5% level.

The industry effects are not included as a regressor in the model because the Gordon-Shapiro model already takes industry into account through the cost of equity, which reflects the systematic risk of the industry via the beta, and through the long-term growth rate which reflects reinvestment opportunity and industry specific profitability through ROE and payout ratio.

While the CAGR is useful to identify trends in the dividend growth rate, the CAGR is a static, single period value applied uniformly across all 18 years of the sample. The formula for calculating the long-term growth rate had to be revised to fit the assumptions of the model. In order to ensure that the long-term dividend growth rate is estimated as accurately as possible, the fundamental growth rate formula is employed (Rahim, 2017). The formula is as follows:

g = ROE x Retention ratio, where the retention ratio is (1 - payout ratio).

The logic behind this formula is that a company can only grow dividends at the same rate that it retains and reinvests earnings.

In order to ensure that the ($K_e > g$) assumption is met, a cap has been introduced to the model to ensure that the growth rate cannot exceed the defined spread of two percentage points between the cost of equity and the long-term growth rate. The implications that this cap may have on the model are further discussed in the limitations section of this study.

4.4 Sensitivity analysis

The Gordon-Shapiro model is an intrinsic valuation method that values the price of a stock based on the inputs from just three variables: the current dividend (D_0), the cost of equity K_e, and the long-term dividend growth rate, *g* (Gordon and Shapiro, 1956). This simplicity is the model's greatest strength but also poses notable limitations. The predicted price of the model relies non-linearly on two estimated parameters, where minor errors in the estimation of either K_e or *g* can cause disproportionately significant deviations in the predicted stock price.

In this section, a sensitivity analysis is conducted on the two estimated key inputs of the Gordon-Shapiro model, the cost of equity K_e and the long-term growth rate *g*, to determine how minor changes in these underlying assumptions affect the model's predicted price relative to actual market price. The purpose of the sensitivity analysis is to investigate whether the model's findings, specifically the undervaluation tendencies of the model, continue to hold with reasonable variations in these key inputs. This section serves three key purposes. First, the analysis serves as a detailed insight into the model's parameter sensitivity, which is crucial for interpreting the results of the regression model. Second, the analysis quantifies how much of an impact the reasonable uncertainty around the estimation of input variables has on the price variance between the model's predicted price and the actual market price, rather than a fundamental failure of the Gordon-Shapiro model's theoretical framework. Third, the analysis highlights the market conditions where the model is most stable, and the conditions where the model starts to break down, contributing to the current debate around the model's viability in modern equity markets.

The sensitivity analysis includes three separate tiers: i) a one-way sensitivity analysis for each parameter: K_e and *g*, ii) a two-way sensitivity table, examining the impact of changes in both parameters simultaneously, and iii) a scenario analysis that tests the model's performance under seven market conditions. In each of the tiers, the base case corresponds to the input values calculated originally for the model using the cost of equity derived from the Capital Asset Pricing Model (CAPM) and the long-term dividend growth rate, calculated using the fundamental growth formula: g = ROE x Retention ratio, for each firm-year observation. Sensitivity to model inputs was measured as percentage change to input parameters, varied by ±5%, ±10%, ±20%, and ±30% from the base case values (DaDalt *et al.*, 2023).

The cost of equity contributes a consistently non-linear negative effect on the predicted price from the Gordon-Shapiro model. As K_e increases, the denominator ($K_e - g$) grows, diminishing the price. Conversely, as the cost of equity falls, the denominator decreases, increasing the predicted price. The sensitivity is more pronounced in firms where the spread ($K_e - g$) is lower. For example, a 10% increase in the cost of equity assumption for Enagás (spread 6.15%) in 2022 resulted in a -9.59% change in price, while the same increase of 10% in the cost of equity assumption had a -17.03% change in price for Roche (Spread 3%) in the same year. This finding is meaningful as it implies that the model's prediction error is directly linked to the size of the spread between the cost of equity and the long-term growth rate ($K_e - g$). Contrary to conventional understanding that utility companies with low-yield and relatively low growth rate have a lower spread, Enagás displays greater stability in price prediction in 2022 under cost of equity uncertainty than Roche. This demonstrates that spread-width is the primary determinant of cost of equity sensitivity in the Gordon-Shapiro model, not industry classification.

The long-term dividend growth rate has an impact on both the numerator and the denominator of the Gordon-Shapiro formula, causing an effect that is stronger than the cost of equity for the majority of the sample period. An increase in *g* raises the dividend expected in the next period (Div_1) and compresses the spread ($K_e - g$) simultaneously, having an increased positive effect on the model's predicted price when compared to the cost of equity which has no effect on the numerator of the formula. The sensitivity to changes in *g* is more significant in observations where the growth rate is near zero or close to the cost of equity. For example, Coca-Cola experienced a decrease in the long-term growth rate between 2017 and 2018 due to temporarily reduced Return on Equity (ROE), which caused a breakdown in the model's performance as the denominator approached zero. In these observations, even slight errors in the estimation of g can cause predicted prices to reach infinity as the denominator ($K_e - g$) approaches zero, rendering the model useless and contributing to the explanation of the outlier residuals observed in the regression model.

To investigate the effects of simultaneous differences in both input variables, a 7x7 two-way sensitivity table was built, combining the cost of equity changes (-20% to +20%) with the long-term growth rate changes (-20% to +20%). The full two-way sensitivity tables for all six companies can be found in ***Appendix 3***. Each of the tables reveal some important features of the Gordon-Shapiro model. First, the interaction between the cost of equity and the growth rate is asymmetric.

Movements along the diagonal, where K_e is increasing, while g falls, or vice versa produces the most extreme price changes. This is a result of the two effects compounding with each other through the denominator. Conversely, proportional increases in both cost of equity and the long-term growth rate have a relatively moderate effect on the predicted price as they partially offset one another.

Second, the predicted price evolution is non-linear and increases exponentially as the spread between (K_e – g) approaches zero. In the two-way table, the cells representing a situation where the cost of equity and growth rate converge produce predicted prices that are approaching an economically impossible situation where the market would assign a near-infinite value to a dividend-paying firm where its growth rate is equal to or in excess of its cost of equity. This is the reason why the key restriction of the model where (K_e > g) is applied.

In this scenario analysis, seven unique scenarios were applied to the sample to test the model's performance under distinct market conditions. These scenarios: Base Case, Optimistic, Pessimistic, Conservative, Aggressive, Bull Market, and Bear Market, were constructed by applying simultaneous proportional adjustments to both K_e and g. A summary of average percentage sensitivities across the sample firms compared to the base case is presented in table 1.4 below.

Scenario	ΔK_e	Δg	**Avg. Price Deviation All 6 Firms**	**Interpretation**
Base Case	0%	0%	-	Current input values
Optimistic	-10%	+10%	+38.2%	Lower discount rate, higher growth
Pessimistic	+10%	-10%	-20.9%	Higher discount rate, lower growth
Conservative	+5%	-5%	-11.7%	Moderate downside
Aggressive	-5%	+5%	+15.7%	Moderate upside
Bull Market	-15%	+15%	+74.7%	Prolonged positive conditions
Bear Market	+15%	-15%	-28.3%	Prolonged negative conditions

Table 1.4 – Scenario Analysis

Nike excluded from the average due to a near-zero spread causing an unrealistic upside potential.

The scenario analysis provides some further significant findings. First, the valuation range between the two extremes: Bull Market and Bear Market conditions is substantial across all six firms included in the sample. For Nestlé, whose spread (K_e – g) is relatively wide and stable, the Bull Market price prediction is +37.32%, while the Bear Market price prediction is -21.43%. For Enagás whose spread is narrower over the sample period the Bull Market price prediction reaches +56.72% over the Base Case, while the Bear Market price prediction is -26.7%. This demonstrates how the model's scenario analysis results are heavily influenced by the structural spread of each firm. Enagás' valuation range between bull and bear scenarios is approximately 52% wider than Nestlé due to structural spread differences.

Second, there is a clear asymmetric relationship between upside and downside scenarios. Due to the presence of the growth rate, *g* in the denominator and numerator, the upside potential for optimistic scenarios tends to create price increases of a greater scale than the price decreases produced in pessimistic scenarios. A key finding of the scenario analysis suggests that the Gordon-Shapiro model may undervalue firms experiencing favourable market conditions, a pattern that is consistent with the findings of the regression analysis in section 4.3.

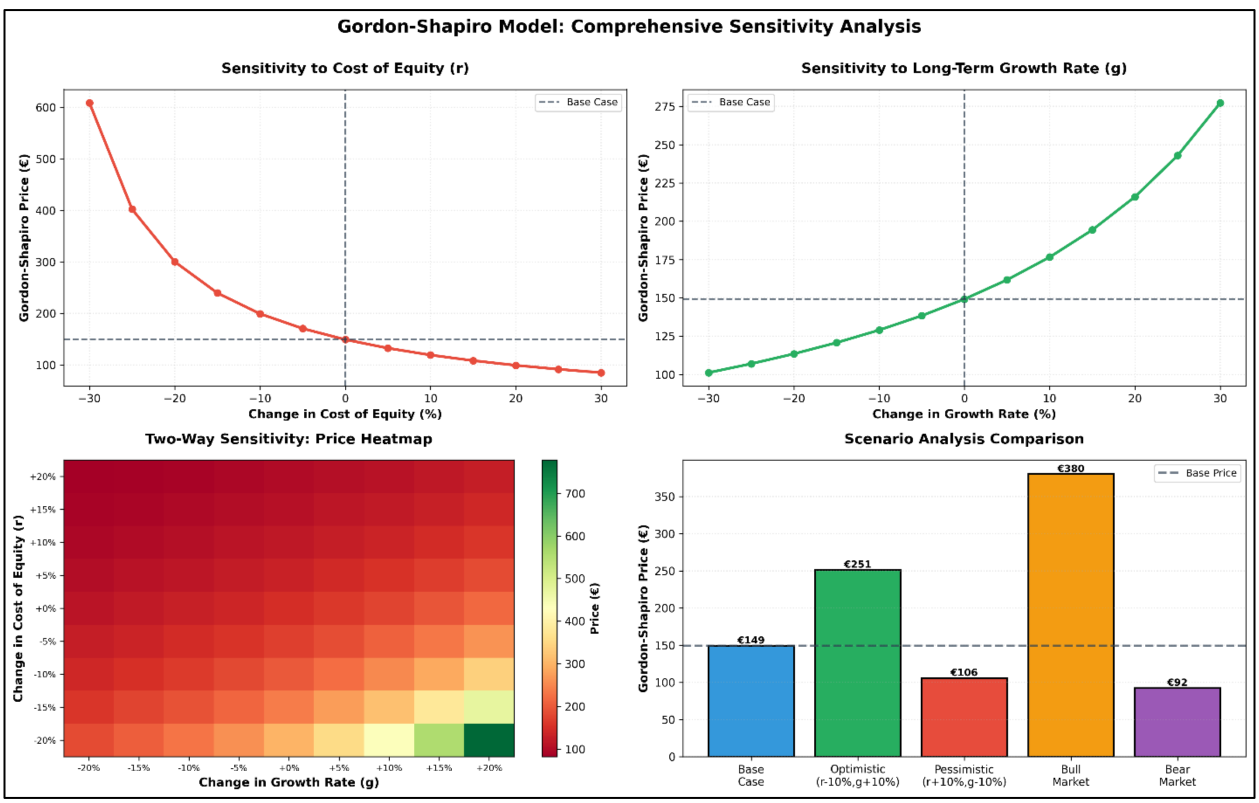

Figure 1.3 – Sensitivity Analysis – Acciona 2025

Figure 1.3 shows the sensitivity analysis conducted for Acciona in 2025, where the Base Case predicted price was €149.15 compared to the actual market price of €185.90. The first image displays the one-way sensitivity analysis for the cost of equity, showing how the Gordon-Shapiro predicted price falls sharply with cost of equity increases. The top right chart shows the one-way sensitivity analysis for the long-term growth rate, and the rising price as the long-term dividend growth rate increases. The bottom left graph shows the two-way sensitivity analysis in the form of a heat map, where highest prices are visible where the growth rate is elevated and the cost of equity is reduced. The bottom right graph shows the scenario analysis and the predicted price respectively.

The results from Acciona are broadly representative of the directional patterns observed across the entire sample. As explained in table 1.4 above, the average price deviation across the five comparable companies ranges from -28.3% under bear market conditions to +74.7% under bull market conditions, confirming that the Gordon-Shapiro model's output is highly sensitive to simultaneous changes in both of the key input variables, with a particular responsiveness in the upside direction due to the dual effect of g on both the numerator and the denominator within the Gordon-Shapiro formula.

This section of the study, while extensive, is subject to some limitations that should be acknowledged. The scenario analysis and changes in model parameters applied in this analysis are symmetric, whereas real-world scenarios are often correlated. For example, rising risk-free rates typically reduce growth expectations at the same time. Additionally, Div_0 remains unchanged while varying the cost of equity and the long-term growth rate, which assumes that dividend policy remains unaffected by discount rate or growth rate changes. In reality these variables are taken into consideration when determining the appropriate dividend policy at firm level. Firms with higher growth rates typically retain more earnings, directly suppressing dividend payments.

4.5 Comparison with other valuation models

The Gordon-Shapiro model produces an intrinsic valuation based on the expected dividend income, discounted using cost of equity. This section aims to provide a comparison against other valuation methods, namely the EV/EBITDA multiple and comparable company analysis. This comparison aims to measure the accuracy of the predicted price obtained from the Gordon-Shapiro model against the price estimated from other industry accepted valuation methods.

The EV/EBITDA multiple is defined as: $\frac{Enterprise\ Value\ (EV)}{EBITDA}$, where the implied equity value per share is therefore derived as: $\frac{(EV/EBITDA_{Industry\ Median} \times EBITDA\ -Net\ Debt)}{Shares\ Outstanding}$

Enterprise value is calculated as market capitalisation plus net debt, where net debt is defined as long-term and short-term minus cash and cash equivalents, and EBITDA is earnings before interest, tax, depreciation and amortisation. The EV/EBITDA multiple is capital structure neutral, accounting for claims from both debt and equity holders, while the Gordon-Shapiro model

estimates equity value only. In order to ensure an accurate comparison across the two approaches, net debt must be subtracted from the estimation provided by the EV/EBITDA multiple to isolate the equity value. Once the equity value (market capitalisation) has been isolated, dividing by the outstanding shares allows for a direct comparison to the Gordon-Shapiro model's predicted price on a per share basis (Deng, Easton and Yeo, 2012).

The comparable company analysis is built by grouping each firm into their respective industry group and gathering a range of similar companies within the same industry. Each firm's observed EV/EBITDA multiple from the 2025 period is subsequently benchmarked against the median EV/EBITDA multiple for the industry from the same period, derived from the sample of similar companies from FactSet. Where firms operate within the same broad industry classifications, peer groups are defined at the sub-sector level, for example, Coca-Cola is benchmarked against beverage companies and Nestlé against food peers. The industry median is preferred to the mean as EV/EBITDA multiples are highly sensitive to outliers (Lie and Lie, 2002). Where the firm's observed EV/EBITDA multiple exceeds the industry median, the firm is classified as relatively overvalued. In contrast, where a firm's observed EV/EBITDA multiple is below the industry median, the firm is considered relatively undervalued. This signal is compared against the directional finding of the Gordon-Shapiro model to investigate whether both methods yield the same result with respect to valuation.

Firm	Industry	Observed EV/EBITDA	Industry Median EV/EBITDA	Signal
Acciona	Infrastructure	6.26x	7.07x	Undervalued
Nestlé	Consumer Staples	13.42x	12.70x	Overvalued
Enagás	Energy	7.80x	12.70x	Undervalued
Coca-Cola	Consumer Staples	21.19x	15.01x	Overvalued
Roche	Pharmaceuticals	13.08x	15.28x	Undervalued
Nike	Consumer Goods	23.30x	9.21x	Overvalued

Table 1.5 – Comparable Company Analysis

It is worth noting that the EV/EBITDA multiple is not typically used in regulated gas industries such as that of Enagás, whose revenues are controlled by the Spanish energy regulator. Analysts often use EV/EBIT as a comparison as it maintains depreciation as a genuine economic cost to maintain infrastructure. EV/EBITDA is applied here to maintain uniformity across the sample.

The Gordon-Shapiro model, the EV/EBITDA multiple and the comparable company analysis vary in both their approach and assumptions. The EV/EBITDA multiple approach has its own limitations. No two companies are identical, which means that choosing a suitable selection of comparable companies is a subjective task. Furthermore, the EV/EBITDA multiple is anchored to prevailing market prices. This may lead to the market itself having an influence on the mispricing of certain sectors (Lie and Lie, 2002). Although the selection process can be subjective, the use of the EV/EBITDA multiple is appropriate for comparing companies across industries as it is capital structure neutral, using enterprise value instead of equity value. The reason this multiple is most appropriate is it allows for comparison across companies with varying leverage profiles, for example capital-intensive Spanish utilities (Acciona and Enagás) against the less intensive consumer names (Coca-Cola and Nike).

The results of the comparable company analysis reveal a varied picture across the sample. Acciona, Enagás, and Roche are highlighted as relatively undervalued on an EV/EBITDA basis. This finding is consistent with the systematic undervaluation tendency found in the Gordon-Shapiro model through the regression analysis. Nestlé, Coca-Cola, and Nike are identified as relatively overvalued. Nike's deviation in particular is extreme, with an observed EV/EBITDA multiple of 23.30x compared to an industry median of 9.21x. This suggests that Nike's market premium reflects brand intangibles and growth expectations that the multiple does not fully capture. Overall, the findings validate the Gordon-Shapiro model's undervaluation signal for the infrastructure, energy and pharmaceutical firms in the sample, while demonstrating that consumer brands may be subject to structural premiums that neither the Gordon-Shapiro model nor the EV/EBITDA valuation multiple can explain.

5. Results

5.1 Key Findings

The empirical analysis provides five principal findings, with each adding to the understanding around the practical applicability and limitations of the Gordon-Shapiro model in public equity markets.

1) The Gordon-Shapiro model displays a systematic undervaluation bias across the sample. The mean predicted price of 73.95 compared to the mean actual market price of 93.58 represents a difference of approximately 21% below the actual market price. The regression analysis confirms this finding, showing consistent directional bias across the sample. This finding is also consistent with prior literature that demonstrates that dividend-based intrinsic valuation methods have a tendency to undervalue market prices where other intangible values contribute to actual market prices (Koller, Goedhart and Wessels, 2020).

2) The predictive accuracy of the model is highly dependent on the specific sector analysed. The model performs best for companies with capital-intensive business models like Acciona, Enagás and Roche. These firms have steady cash flows, consistent with the assumption of the Gordon-Shapiro model. The steady cash flows and regulatory landscape allow for a stable dividend policy. The model performs less accurately for consumer-based firms, with the model struggling to accurately predict price for Coca-Cola and Nike. Market valuations in the consumer section often include intangible values and growth expectations that do not always strictly apply to the constraints of the Gordon-Shapiro model.

3) The long-term dividend growth rate, *g,* is the most sensitive input to the model. The one-

way sensitivity analysis shows that g affects both the numerator (Div_1) and the denominator ($K_e - g$) of the Gordon-Shapiro model simultaneously. The scenario analysis confirms this finding, particularly where the spread ($K_e - g$) is narrower. Under these circumstances the model can predict prices that deviate significantly from the actual market price, causing unreliability from the model.

4) The spread between the cost of equity and the long-term dividend growth rate ($K_e - g$) is the primary determinant of model sensitivity, not industry classification. The sensitivity analysis displays that Enagás, a regulated gas utility company, shows greater price stability under cost of equity uncertainty than Roche in 2022, due to its structurally wider spread. This questions the conventional assumption that utility companies are more suited to the Gordon-Shapiro model based on industry alone and instead identifies the spread as a key factor in model performance.

5) The directional findings from the Gordon-Shapiro model are consistent with the results from the EV/EBITDA comparable company analysis. Across the six firms, the undervaluation tendency remained robust for Acciona, Enagás, and Roche signalling consistency across the two valuation methods. Similarly, the overvaluation tendency for Coca-Cola and Nike from the comparable company analysis is consistent with the findings around market-based intangibles and growth expectations that fall outside the model's assumptions.

5.2 Limitations to the model

The empirical findings must be interpreted under the constraints of the model's fundamental assumptions. The perpetuity assumption means that the model treats firms as though they will continue to pay dividends perpetually, which may overvalue firms in saturated industries or those in decline. The constant geometric growth proves challenging for firms facing periods of transition. For example, Acciona who suspended their dividend in 2014.

The contrast with arithmetic growth annuities means that minor inaccuracies in growth rate (g) and cost of equity (K_e) have the potential to produce extreme valuation discrepancies. While an arithmetic growth formula would produce linear projections around dividend growth, the geometric model compounds growth at an exponential rate. Additionally, companies in transitory periods, facing non-constant growth patterns require more complex approaches that the Gordon-Shapiro model cannot capture.

The implementation of a growth rate cap of a two-percentage-point spread may produce predicted prices that are artificially lower than the market price, especially in observations where the cost of equity (K_e) is naturally very close to the long-term growth rate (g).

The use of a fixed Country Risk Premium is a recognised limitation to the model seeing as CRPs can fluctuate on a yearly basis. However, for the purpose of this study, the CRP for Spain and Switzerland has been assumed to be fixed, justified by the relative stability of both economies over the sample period and based on the most current research available from Damodaran's equity risk premium methodology paper (Damodaran, 2026).

Finally, the reduced cross-sectional sample of six firms restricts the ability to apply the findings as a broad rule across a range of industries. The results obtained from this study could reflect firm or industry-specific biases rather than an accurate representation of the predictive capabilities of the Gordon-Shapiro model across public equity markets.

6. Conclusions

The purpose of this study was to assess the predictive accuracy of the Gordon-Shapiro model through empirical analysis for six stable, dividend-paying firms across a diverse range of sectors over the sample period 2008-2025. The findings of this study contribute to the ongoing debate surrounding the practicality of the model and its viability in contemporary equity markets.

The results confirm that the Gordon-Shapiro model shows meaningful predictive accuracy for mature, regulated firms with stable dividend policy and recurring cash flow generation. For firms such as Acciona, Enagás, and Roche, the model provides intrinsic value estimates that are directionally aligned with the market-based valuation signals obtained from the comparable company analysis using the EV/EBITDA multiple. This shows evidence that the model remains relevant in sectors where dividends are a real indicator of earnings capacity. The regression analysis strengthens this finding. The Gordon-Shapiro model predicted price coefficient converges to 0.990 once firm-specific structural differences were considered. This indicates the model has an almost perfect proportional relationship with actual market prices at an individual firm level.

The study however reveals clear limitations that must be addressed. The model has a systematic undervaluation bias, especially for consumer staple and consumer discretionary firms. This reflects the model's difficulty in capturing intangible corporate value, growth optionality and overall sentiment of the market. Nike's observed EV/EBITDA multiple of 23.30x compared to the industry median of 9.21x highlights the premium that the market commands for firms with a strong brand reputation. This finding supports prior literature that states the model should be used to complement other valuation methods, as opposed to a single, standalone valuation method (Avanzi, Tu and Wong, 2016).

The sensitivity analysis demonstrates the model's dependence on two key input assumptions: the cost of equity, K_e, and the long-term dividend growth rate, *g.* Minor errors in the estimation of these two input variables, particularly in estimations where the spread ($K_e - g$) is narrow, can produce extreme and economically unrealistic valuations. This weakness stresses the importance of careful consideration when estimating model assumptions. The scenario analysis highlights the effects of simultaneous changes in the key input variable, with the model's predicted price being shifted by an average of -28.3% in bear market conditions and +74.7% in bull market conditions. The asymmetry between downside and upside is a direct consequence of *g* being present in both the numerator and denominator of the Gordon-Shapiro formula. This confirms the model's tendency to produce larger valuation increases under favourable market conditions than valuation decreases in adverse conditions.

In summary, the findings of this study suggest that the Gordon-Shapiro model remains a valid and important tool for intrinsic value estimation, subject to three clear requirements: the company must operate in a mature, regulated industry, dividend policy must be consistent and closely tied with the overall earnings capacity of the firm, and finally the spread between the cost of equity and the long-term dividend growth rate must be wide enough to ensure the stability of the model. In the case that these three conditions are met, the model provides a clear, theoretically sound estimate of equity value that is relatively consistent with market-based comparable analysis. Where the requirements are not met, the model's limitations overpower any accurate estimation of intrinsic value, strengthening the rationale that the model should be used in parallel with other valuation methods to ensure the most accurate results.

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Por la presente, yo, Benjamin Burgess, estudiante de E4 de la Universidad Pontificia Comillas al presentar mi Trabajo Fin de Grado titulado "An Empirical Study of the Gordon-Shapiro Model and its Predictive Accuracy in Public Equity Markets", declaro que he utilizado la herramienta de Inteligencia Artificial Generativa ChatGPT u otras similares de IAG de código sólo en el contexto de las actividades descritas a continuación:

1. **Brainstorming de ideas de investigación:** Utilizado para idear y esbozar posibles áreas de investigación.
2. **Referencias:** Usado conjuntamente con otras herramientas, como Science, para identificar referencias preliminares que luego he contrastado y validado.
3. **Metodólogo:** Para descubrir métodos aplicables a problemas específicos de investigación.
4. **Interpretador de código:** Para realizar análisis de datos preliminares.
5. **Constructor de plantillas:** Para diseñar formatos específicos para secciones del trabajo.
6. **Corrector de estilo literario y de lenguaje:** Para mejorar la calidad lingüística y estilística del texto.
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Afirmo que toda la información y contenido presentados en este trabajo son producto de mi investigación y esfuerzo individual, excepto donde se ha indicado lo contrario y se han dado los créditos correspondientes (he incluido las referencias adecuadas en el TFG y he explicitado para que se ha usado ChatGPT u otras herramientas similares). Soy consciente de las implicaciones académicas y éticas de presentar un trabajo no original y acepto las consecuencias de cualquier violación a esta declaración.

Fecha: 23/03/2026

Firma: Benjamin Burgess

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8. Appendix

Appendix 1 – Regression Results

Gordon-Shapiro Model: Regression Results

	Dependent variable:	
	Actual Price	
	(1)	(2)
GS Price	0.835***	0.990***
	(0.034)	(0.096)
Beta		31.053*
		(17.042)
ROE		0.108
		(0.228)
Payout Ratio		0.002
		(0.061)
Constant	32.197***	0.300
	(4.148)	(20.372)
Company FE	No	Yes
Industry FE	No	No
Observations	107	107
R2	0.849	0.903
Adjusted R2	0.847	0.894
Note:	*p<0.1; **p<0.05; ***p<0.01	

Appendix 2 – Regression Results

```
Coefficients: (5 not defined because of singularities)
                          Estimate Std. Error t value Pr(>|t|)    
(Intercept)              -57.28982   10.01404  -5.721 1.20e-07 ***
beta                     -48.64252   10.93470  -4.448 2.33e-05 ***
roe                        0.21730    0.14077   1.544  0.12598    
payout                     0.03675    0.03820   0.962  0.33841    
growth_rate              486.39979  150.85074   3.224  0.00173 ** 
rf                      -503.68838  198.15419  -2.542  0.01263 *  
industryConsumer_Goods    -4.31363    7.11112  -0.607  0.54555    
industryEnergy            78.72872    6.97364  11.289  < 2e-16 ***
industryFood              81.35643    7.57152  10.745  < 2e-16 ***
industryInfrastructure    60.61682    9.64898   6.282 9.74e-09 ***
industryPharmaceuticals   85.82212    7.88401  10.886  < 2e-16 ***
companyCoca-Cola                NA         NA      NA       NA    
companyEnagas                   NA         NA      NA       NA    
companyNestle                   NA         NA      NA       NA    
companyNike                     NA         NA      NA       NA    
companyRoche                    NA         NA      NA       NA    
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 16.96 on 96 degrees of freedom
Multiple R-squared:  0.8598,	Adjusted R-squared:  0.8452 
F-statistic: 58.87 on 10 and 96 DF,  p-value: < 2.2e-16
```

Appendix 3 – Sensitivity Analysis

Extreme values (e.g. Nike 2025 at 8,564.25) occur when the spread (Ke-g) approaches zero. These situations are economically unrealistic and highlight the model's sensitivity to changes in input variables.

TWO-WAY SENSITIVITY TABLE – Acciona 2025

Gordon-Shapiro Price: Sensitivity to Cost of Equity (*Ke*) and Growth Rate (g)

	g →	-20%	-10%	-5%	+0%	+5%	+10%	+20%
Ke ↓		0.0364	0.0409	0.0432	0.0455	0.0477	0.0500	0.0545
-20%	0.0604	184.82	229.00	259.86	300.13	354.88	433.64	775.77
-10%	0.0679	140.61	165.01	180.57	199.27	222.20	250.94	337.75
-5%	0.0717	125.59	144.78	156.66	170.61	187.20	207.27	263.39
+0%	0.0755	113.47	128.97	138.35	**149.15**	161.73	176.55	215.87
+5%	0.0792	103.48	116.27	123.87	132.49	142.36	153.76	182.87
+10%	0.0830	95.11	105.85	112.13	119.18	127.13	136.18	158.62
+20%	0.0905	81.87	89.76	94.27	99.24	104.73	110.84	125.38

Note: Yellow cells represent base case scenario

TWO-WAY SENSITIVITY TABLE – Coca-Cola 2025

Gordon-Shapiro Price: Sensitivity to Cost of Equity (*Ke*) and Growth Rate (g)

	g →	-20%	-10%	-5%	+0%	+5%	+10%	+20%
Ke ↓		0.0226	0.0254	0.0268	0.0282	0.0296	0.0310	0.0339
-20%	0.0466	21.73	24.69	26.49	28.57	30.99	33.85	41.47
-10%	0.0524	17.49	19.37	20.46	21.69	23.06	24.62	28.45
-5%	0.0553	15.93	17.48	18.37	19.36	20.45	21.67	24.58
+0%	0.0582	14.63	15.93	16.67	**17.48**	18.37	19.35	21.65
+5%	0.0611	13.53	14.64	15.26	15.93	16.67	17.48	19.34
+10%	0.0640	12.58	13.53	14.07	14.64	15.26	15.93	17.47
+20%	0.0699	11.03	11.76	12.16	12.59	13.05	13.54	14.65

Note: Yellow cells represent base case scenario

TWO-WAY SENSITIVITY TABLE – Enagás 2025

Gordon-Shapiro Price: Sensitivity to Cost of Equity (*Ke*) and Growth Rate (g)

	g →	-20%	-10%	-5%	+0%	+5%	+10%	+20%
Ke ↓		0.0168	0.0189	0.0199	0.0210	0.0220	0.0231	0.0252
-20%	0.0408	20.59	22.61	23.77	25.06	26.49	28.09	31.94
-10%	0.0459	16.98	18.34	19.10	19.93	20.83	21.81	24.07
-5%	0.0484	15.61	16.76	17.39	18.08	18.81	19.61	21.43
+0%	0.0510	14.45	15.43	15.96	**16.54**	17.16	17.82	19.31
+5%	0.0535	13.45	14.29	14.75	15.24	15.77	16.33	17.57
+10%	0.0561	12.57	13.31	13.71	14.14	14.59	15.07	16.12
+20%	0.0612	11.13	11.71	12.02	12.34	12.69	13.05	13.84

Note: Yellow cells represent base case scenario

TWO-WAY SENSITIVITY TABLE – Nestlé 2025

Gordon-Shapiro Price: Sensitivity to Cost of Equity (*Ke*) and Growth Rate (g)

	g →	-20%	-10%	-5%	+0%	+5%	+10%	+20%
Ke ↓		0.0096	0.0108	0.0114	0.0120	0.0126	0.0133	0.0145
-20%	0.0336	128.31	135.25	139.00	142.97	147.16	151.60	161.31
-10%	0.0378	109.18	114.19	116.86	119.66	122.60	125.67	132.31
-5%	0.0399	101.61	105.94	108.24	110.65	113.15	115.78	121.39
+0%	0.0420	95.02	98.80	100.81	**102.89**	105.06	107.32	112.14
+5%	0.0441	89.23	92.57	94.33	96.15	98.05	100.02	104.20
+10%	0.0463	84.10	87.07	88.63	90.24	91.92	93.65	97.31
+20%	0.0505	75.44	77.83	79.08	80.36	81.69	83.07	85.95

Note: Yellow cells represent base case scenario

TWO-WAY SENSITIVITY TABLE – Nike 2025

Gordon-Shapiro Price: Sensitivity to Cost of Equity (*Ke*) and Growth Rate (g)

	g →	-20%	-10%	-5%	+0%	+5%	+10%	+20%
Ke ↓		0.0511	0.0575	0.0607	0.0639	0.0671	0.0703	0.0767
-20%	0.0768	16.41	22.00	26.47	33.16	44.29	66.45	8564.25
-10%	0.0863	11.94	14.68	16.56	18.97	22.19	26.70	44.65
-5%	0.0911	10.51	12.58	13.95	15.63	17.76	20.55	29.82
+0%	0.0959	9.38	11.01	12.05	**13.29**	14.81	16.70	22.39
+5%	0.1007	8.48	9.79	10.60	11.56	12.69	14.07	17.92
+10%	0.1055	7.73	8.81	9.47	10.23	11.11	12.15	14.94
+20%	0.1151	6.57	7.34	7.80	8.31	8.89	9.55	11.21

Note: Yellow cells represent base case scenario

TWO-WAY SENSITIVITY TABLE – Roche 2025

Gordon-Shapiro Price: Sensitivity to Cost of Equity (*Ke*) and Growth Rate (g)

	g →	-20%	-10%	-5%	+0%	+5%	+10%	+20%
Ke ↓		0.0138	0.0156	0.0164	0.0173	0.0182	0.0190	0.0208
-20%	0.0378	409.76	442.33	460.58	480.38	501.91	525.43	579.59
-10%	0.0426	342.31	364.85	377.24	390.48	404.66	419.87	453.93
-5%	0.0449	316.27	335.47	345.94	357.07	368.91	381.55	409.53
+0%	0.0473	293.92	310.47	319.44	**328.92**	338.97	349.64	373.05
+5%	0.0497	274.52	288.94	296.71	304.89	313.53	322.65	342.53
+10%	0.0520	257.52	270.20	277.00	284.13	291.64	299.53	316.63
+20%	0.0568	229.15	239.17	244.51	250.08	255.90	261.99	275.04

Note: Yellow cells represent base case scenario