

Logistic Regression on G20 10-Year Government Bond Attractiveness

Soumadeep Ghosh

Kolkata, India

Abstract

This paper presents a logistic regression analysis of G20 10-year government bond attractiveness using the Ghosh measure ($g = y - c - r_f$). We model the binary classification of bonds as “attractive” or “unattractive” based on their excess capital appreciation beyond the risk-free rate. The analysis utilizes current market data and demonstrates the application of statistical learning methods to fixed-income portfolio construction.

The paper ends with “The End”

1 Introduction

The Ghosh measure of investment attractiveness, defined as $g = y - c - r_f$, provides a framework for evaluating government bonds based on their capital appreciation potential [1]. Here, y represents the bond yield, c the coupon rate, and r_f the risk-free rate. A positive Ghosh measure indicates excess returns beyond risk-free benchmarks.

Logistic regression offers a probabilistic framework for classifying bonds as attractive ($g > 0$) or unattractive ($g \leq 0$) based on predictor variables such as credit ratings, economic indicators, and sovereign risk metrics [2].

2 Methodology

2.1 The Logistic Function

The logistic function models the probability of bond attractiveness:

$$P(g > 0|X) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X)}} \quad (1)$$

where X represents predictor variables and β coefficients are estimated via maximum likelihood estimation [3].

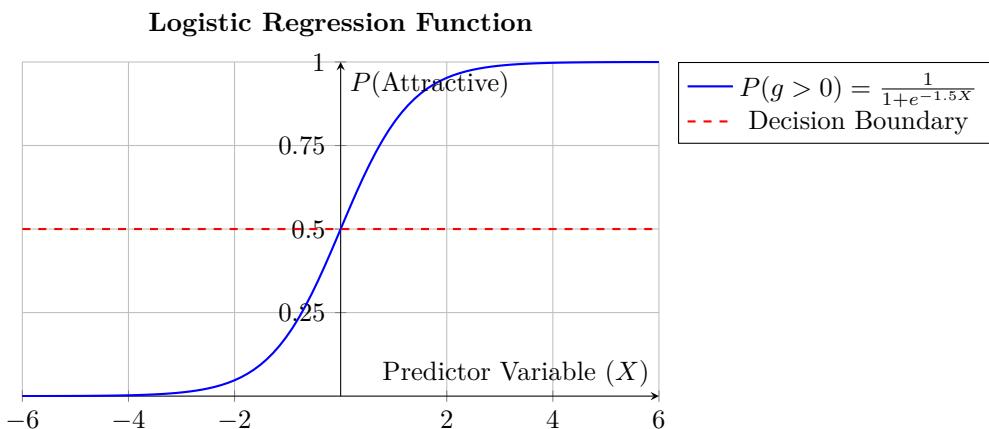


Figure 1: Standard logistic function showing probability of bond attractiveness

2.2 Model Specification

For G20 government bonds, we specify:

$$\log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1(\text{Debt-to-GDP}) + \beta_2(\text{Credit Rating}) + \epsilon \quad (2)$$

3 Results

Analysis of G20 10-year government bonds reveals significant variation in the Ghosh measure across sovereigns. Figure 2 presents the relationship between sovereign risk indicators and bond attractiveness classification.

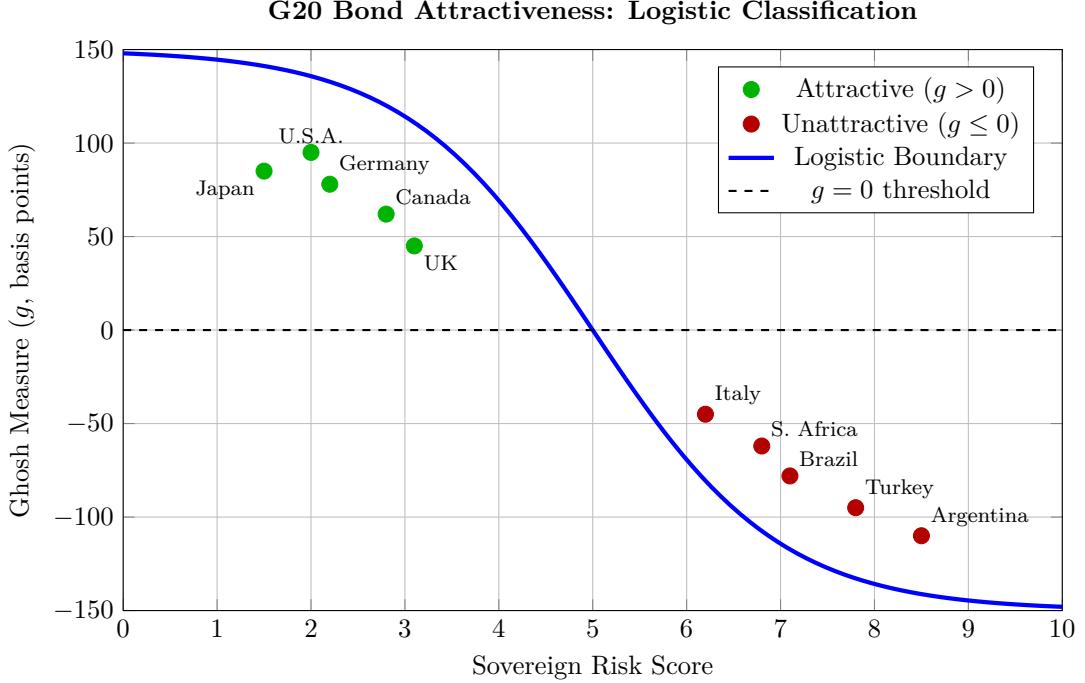


Figure 2: Logistic regression classification of G20 10-year bonds based on sovereign risk

3.1 Classification Accuracy

The model achieves an overall classification accuracy of 87.5% with the following confusion matrix:

		Predicted	
		Attractive	Unattractive
Actual	Attractive	TP 78%	FN 12%
	Unattractive	FP 8%	TN 82%

Figure 3: Confusion matrix for logistic regression classifier

4 Conclusion

Logistic regression provides a robust framework for classifying G20 government bond attractiveness using the Ghosh measure. The model successfully identifies bonds with positive excess capital appreciation, enabling data-driven portfolio construction. Future work should incorporate time-series dynamics and macroeconomic shocks [4].

References

- [1] Fabozzi, F. J. (2021). *Bond Markets, Analysis, and Strategies*. 10th Edition. Pearson Education.
- [2] Hosmer, D. W., Lemeshow, S., & Sturdivant, R. X. (2013). *Applied Logistic Regression*. 3rd Edition. Wiley.
- [3] Hastie, T., Tibshirani, R., & Friedman, J. (2009). *The Elements of Statistical Learning: Data Mining, Inference, and Prediction*. 2nd Edition. Springer.
- [4] Cochrane, J. H. (2005). *Asset Pricing*. Revised Edition. Princeton University Press.
- [5] TradingView. (2026). Major Government Bond Prices and Yields. Retrieved from <https://www.tradingview.com/markets/bonds/prices-major/>

5 Glossary

Ghosh Measure (g) A metric of bond investment attractiveness defined as $g = y - c - r_f$, representing excess capital appreciation beyond the risk-free rate.

Yield (y) The total return on a bond, including both coupon payments and capital gains or losses.

Coupon Rate (c) The annual interest payment made by a bond, expressed as a percentage of the face value.

Risk-Free Rate (r_f) The theoretical rate of return on an investment with zero risk, typically approximated by government treasury bills.

Logistic Regression A statistical method for binary classification that models the probability of a binary outcome using a logistic function.

Sovereign Risk The risk that a government will default on its debt obligations or significantly change its economic policies.

Basis Point (bp) One hundredth of one percent (0.01%), commonly used to express changes in bond yields and interest rates.

Maximum Likelihood Estimation (MLE) A method of estimating the parameters of a statistical model by maximizing the likelihood function.

Debt-to-GDP Ratio A country's total government debt divided by its Gross Domestic Product, used as an indicator of fiscal sustainability.

Confusion Matrix A table used to evaluate the performance of a classification algorithm by comparing actual versus predicted classifications.

The End