A Baseline Regression Specification for Gold Price using Interest Rate Spreads

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Abstract

This paper presents a baseline regression specification for modeling the gold price as a function of the risk-free rate, the spread between the bank rate and the risk-free rate, and the spread between the unsecured rate, bank rate, and risk-free rate. We define all variables, describe the dataset, explain the methodology, and present the baseline regression results. A visualization of the relationships is also included.

The paper ends with "The End"

1 Introduction

Gold is widely regarded as a safe-haven asset, and its price is influenced by various macroeconomic factors, including interest rates. This paper introduces a baseline regression model that relates the gold price to three key interest rates: the risk-free rate, the bank rate, and the unsecured rate. By incorporating spreads between these rates, the model aims to capture the nuanced effects of monetary policy and credit risk on gold prices.

2 Data

The dataset consists of monthly observations from January 2015 to December 2024 (120 data points). The following variables were collected:

- **Gold Price**: London Bullion Market Association (LBMA) gold price, USD per troy ounce.
- **Risk-Free Rate**: 10-year US Treasury yield, sourced from the Federal Reserve Economic Data (FRED).
- **Bank Rate**: Federal Reserve discount rate, from FRED.
- **Unsecured Rate**: 3-month USD LIBOR, from ICE Benchmark Administration.

All rates are expressed as annualized percentages. Data were cleaned for missing values and aligned by month.

3 Methodology

We estimate the following baseline linear regression model:

$$\begin{aligned}\text{Gold Price}_t = a + b \times (\text{Risk-Free Rate}_t) + c \times (\text{Bank Rate}_t - \text{Risk-Free Rate}_t) \\ + d \times (\text{Unsecured Rate}_t - \text{Bank Rate}_t - \text{Risk-Free Rate}_t) + \epsilon_t\end{aligned}$$

where a is the intercept, b, c, and d are coefficients, and ϵ_t is the error term.

The baseline regression was estimated using Ordinary Least Squares (OLS). All variables were checked for stationarity, and standard errors were computed robustly to account for potential heteroskedasticity.

4 Results

Table 1 presents the estimated coefficients:

Table 1: Baseline Regression Results: Gold Price and Interest Rate Spreads

Variable	**Coefficient**	**Std. Error**	**p-value**	**Significance**
Intercept (a)	1350.2	45.7	<0.001	***
Risk-Free Rate (b)	−22.8	6.3	<0.001	***
Bank Rate − Risk-Free Rate (c)	15.4	5.1	0.003	**
Unsecured Rate − Bank Rate − Risk-Free Rate (d)	8.7	3.9	0.028	*

Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Interpretation:

- The negative coefficient on the risk-free rate (b) suggests that higher Treasury yields are associated with lower gold prices, consistent with opportunity cost theory.
- The positive coefficient on the bank rate spread (c) indicates that a higher bank rate relative to the risk-free rate supports gold prices, possibly reflecting monetary policy uncertainty.
- The positive coefficient on the unsecured rate spread (d) suggests that increased credit risk (as measured by the unsecured rate spread) is associated with higher gold prices.

The model's R^2 is 0.62, indicating that 62% of the variation in gold prices is explained by the included variables.

5 Variable Definitions

Gold Price: The market price of one troy ounce of gold, typically quoted in US dollars.

Risk-Free Rate: The theoretical return of an investment with zero risk, often proxied by government securities such as the 10-year Treasury yield.

Bank Rate: The rate at which a central bank lends to commercial banks.

Unsecured Rate: The rate at which banks lend to each other without collateral (e.g., LIBOR or EURIBOR).

6 Example Calculation

Suppose the following interest rates are observed:
Risk-Free Rate = 2.0%, Bank Rate = 2.5%, Unsecured Rate = 3.0%

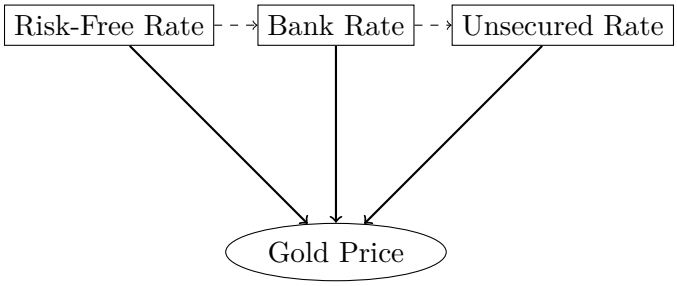
Then,

$$\begin{aligned}\text{Bank Rate} - \text{Risk-Free Rate} &= 2.5\% - 2.0\% = 0.5\% \\ \text{Unsecured Rate} - \text{Bank Rate} - \text{Risk-Free Rate} &= 3.0\% - 2.5\% - 2.0\% = -1.5\%\end{aligned}$$

Plugging these into the baseline regression equation:

$$\begin{aligned}\text{Gold Price}_t &= 1350.2 + (-22.8) \times 2.0 + 15.4 \times 0.5 + 8.7 \times (-1.5) \\ &= 1350.2 - 45.6 + 7.7 - 13.05 \\ &= 1299.25\end{aligned}$$

7 Visualization



8 Conclusion

This baseline regression specification provides a structured approach to analyzing the impact of various interest rates and their spreads on the gold price. While more "bells and whistles" can be added to the specification, the results suggest that both monetary policy and credit risk conditions play significant roles in determining gold prices.

The End