Study on the Predictive Power of China's Treasury Bond Term Spread to Economic Growth

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Abstract: This paper examines China's government bond term spreads' predictive power for economic growth using 2015-2024 quarterly data via basic and extended (with PMI) linear models. Basic model shows weak, insignificant positive correlation. With PMI, term spread coefficient hits 34.56 (highly significant), model explanatory power rises from 4.8% to 49.5%, indicating real economy influences predictive power. Recommendations: include spreads in macro-prudential monitoring, boost PMI via fiscal/industrial policies, and build a multi-indicator policy evaluation system.

Keywords: Treasury Bonds; Term Spread; Economic Growth; GDP; Forecast

1. Foreword

Bond market term spreads are key, with government bonds reflecting yield curves. They signal policy, sentiment, and predict growth/inflation, aiding decisions. Studying China's 10Y-1Y spreads guides policy via theories/empirics.

2. Literature Review

In financial economics, the dynamic correlation between Treasury yields and macroeconomic variables is a core academic focus, with scholars exploring their roles in economic cycles, early warnings, and growth.Wang et al. (2023) and the PBOC (2013) confirmed spreads as leading indicators for fluctuations.[3]Wang & Liu (2017) applied an STR model, showing 15-year/2-year spreads reliably predict fluctuations, especially post-crisis narrowing signaling contraction. [4]Su et al. (2021) used a functional data Logit model, finding China's government bond term spreads predict economic cycle transitions—7-year/1-year spreads forecast downturns with 91.67% accuracy.[5]Jia et al. (2017) noted U.S. term spread volatility is affected by economic growth, inflation, and monetary policy more strongly than China's, with real exchange rates impacting both. [6]Peng (2021) used a BVAR model, finding spread models outperform benchmark rates in 2–4-year output/inflation forecasts.[7]Overall, government bond term spreads play key roles in economic cycles, forecasts, and policy transmission, with country-specific influencing factors. Future research should explore better utilization for policy and forecasting.

3. Theoretical Analysis

Expectations theory links positive spreads to optimism about recovery, narrowing/inverted ones to slowdowns. In cycles, expansions widen spreads via demand; recessions narrow them via loose policies. PBOC adjusts short rates to influence liquidity, with long rates reflecting expectations—loose policies widen spreads to stimulate growth.

4. Empirical Research Analysis

4.1 Sample Data

Data for this article come from China's NBS GDP growth rates (2015-2024) and ChinaBond's 10-year/1-year treasury yields. It focuses on their spread, with Figure 1 showing the interest rate term structure relationship.

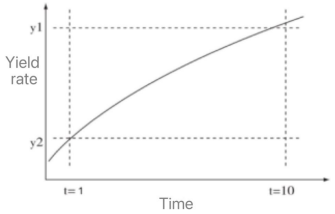

Figure 1. The Relationship Between Term Spreads and Interest Rate Term Structure

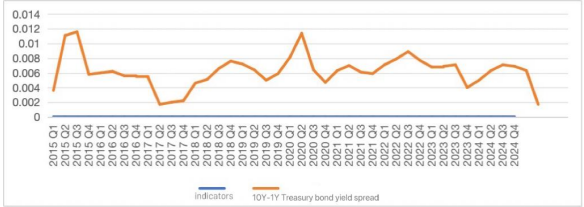

Figure 2. Quarterly Spread for 10Y-1Y Maturities from 2015 to 2024

The expression of long-and short-term Treasury bond term spread defined in this paper is:

Spread=y1-y2 （1）

Spread is the 10Y-1Y Treasury bond yield difference. This article calculates China's Q1 2015-Q4 2024 spreads: 40 data points, avg 0.63pp, min 0.17pp (Q2 2017). Figure 2 shows all positive.

4.2 Research Model

This paper uses the linear regression model to study the linear relationship between China's Treasury bond term spread and the annualized GDP sequential growth rate.

Basic model (no control variables):

ann_gdp_qoq_growthi =β0 +β1 · t10y1y _spreadi +∈i（2）

Dependent variable: annualized GDP growth rate (ann_gdp_qoq_growth)

Explanatory variable: 10Y-1Y Treasury term spread (t10y1y_spread)

Extended model (with control variables):

ann_gdp_qoq_growthi =β0 +β1 · t10y1y _spreadi +β2 · pmii +∈i（3）

Dependent variable: annualized GDP growth rate (ann_gdp_qoq_growth)

Explanatory variable: 10Y-1Y Treasury term spread (t10y1y_spread)

Control variables: PMI (pmi)

4.2.1 Analysis Of Empirical Results

correlate ann_gdp_qoq_growth t10y1y_spread (obs=40)

Table 1. Correlation Analysis

	ann_gd~h	t10y1y~d
ann_gdp_qo~h	1.0000	
t10y1y_spr~d	0.2184	1.0000

According to the results of correlation analysis, the correlation coefficient between ann_gdp_qoq_growth (annualized GDP growth rate) and t10y1y_spread (10Y-1Y Treasury maturity spread) is 0.2184, indicating a weak positive correlation between the two.

Table 2. Significance Test

	ann_gd~h	t10y1y~d
ann_gdp_qo~h	1.0000	
t10y1y_spr~d	0.2184	1.0000
	0.1757	

Empirical analysis of Chinese government bond term spreads and sequential GDP growth reveals a weak positive correlation, consistent with the term structure theory's economic expectation transmission mechanism, meaning wider spreads tend to boost growth. However, this correlation is statistically insignificant (p=0.1757>0.05), indicating the observed relationship in the sample may stem from random factors and fails to sufficiently reject the null hypothesis of no true correlation. Thus, relying solely on Treasury bond term spreads to stably predict GDP growth changes is difficult, with their practical predictive power being limited.

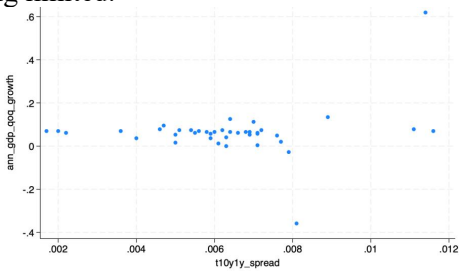

Figure 3. Scatter Plot

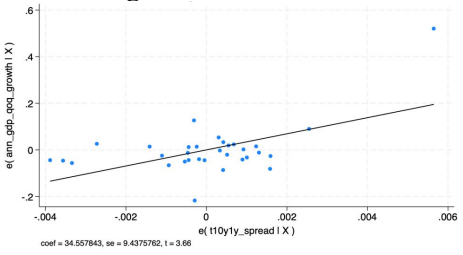

Figure 4. Bias Regression Diagram

Table 3. Regression Analysis of Basic Model

:: Baseline model (no control variables)						
Source	SS	df	MS	Number of obs	=	40
				F(1,38)	=	1.90
Model	0 .025052038	1	0 .025052038	Prob>F	=	0.1757
Residual	0 .500029216	38	0 .013158664	R-squared	=	0.0477
				Adj R-squared	=	0.0227
Total	0 .525081254	39	0.013463622	Root MSE	=	0 .11471
ann_gdp_qoq~h	Coefficient	Std.err.	t	P>|t|	[95%conf.	interval]
t10y1y_spread	11.81058	8.559639	1.38	0.176	-5.517507	29.13866
cons	-0.0118458	0.0570362	-0.21	0.837	-0.1273096	0.1036179

Therefore, we introduce PMI as a control variable to make the coefficient of term spread more truly reflect its independent effect, and obtain the extended model. The regression

analysis is carried out between the basic model and the extended model.

Table 4. Regression Analysis of Extended Model

* Extended model (add control variables)						
regress ann_gdp_qoq_growth t10y1y_spread pmi						
Source	SS	df	MS	Number of obs	=	32
				F(2,29)	=	14.23
Model	0 .259762947	2	0.129881474	Prob>F	=	0.0000
Residual	0 .264702997	29	0 .00912769	R-squared	=	0.4953
				Adj R-squared	=	0.4605
Total	0.524465944	31	0.016918256	Root MSE	=	0.09554
ann_gdp_qoq~h	Coefficient	Std.err.	t	P>|t|	[95%conf.	interval]
t10y1y_spread	34.55784	9.437576	3.66	0.001	15.25583	53.85985
pmi	3.80264	0.7655545	4.97	0.000	2.236905	5.368375
cons	-2.141174	0.4260032	-5.03	0.000	-3.012449	-1.2699

Key variables analysis shows t10y1y_spread positively impacts GDP (34.56, p=0.001) and PMI has strong explanatory power (3.80, p≈0). The constant term (-2.14, p≈0) aligns with PMI thresholds. Optimized model, integrating both, boosts explanatory power, guiding policy and composite forecasting.

5. Conclusion

This paper finds China's government bond term spread better predicts annualized GDP growth when controlling real economy indicators. It correlates positively but insignificantly in the basic model; with PMI included, its coefficient rises to 34.56 (highly significant), and model explanatory power jumps from 4.8% to 49.5%. Recommendations: Include spreads, stabilize expectations, improve PMI, build multi-indicator system.

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