The Complete Treatise on the Inflation Risk Premia in Turkey: Theoretical Framework, Empirical Analysis, and Policy Implications

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Abstract

This treatise provides a comprehensive analysis of inflation risk premia in Turkey's financial markets, examining both theoretical foundations and empirical evidence from 2003-2024. We investigate the determinants of inflation risk compensation demanded by investors in Turkish government bonds and develop a novel decomposition framework that separates expected inflation from risk premia components. Our analysis reveals that Turkey's inflation risk premia exhibit significant time variation, driven by monetary policy credibility, external financing conditions, and macroeconomic uncertainty. The study contributes to understanding emerging market inflation dynamics and provides policy recommendations for enhancing monetary policy effectiveness in Turkey's unique economic environment.

The treatise ends with "The End"

Contents

1 Introduction **3**

2 Literature Review **3**

3 Theoretical Framework **4**
- 3.1 The Inflation Risk Premium Decomposition 4
- 3.2 Affine Term Structure Model 4
- 3.3 Turkey-Specific Extensions 4

4 Data and Methodology **5**
- 4.1 Data Sources 5
- 4.2 Empirical Methodology 5

5 Empirical Results **5**
- 5.1 Descriptive Statistics and Stylized Facts 5
- 5.2 Time Series Evolution of Inflation Risk Premia 6
- 5.3 Regime Analysis and Structural Breaks 7
- 5.4 Determinants of Inflation Risk Premia 8
- 5.5 Policy Transmission Analysis 8

6 Term Structure Implications **9**
6.1 Yield Curve Decomposition 9
6.2 Term Premium Dynamics 9

7 International Comparisons **10**

8 Policy Implications **11**
8.1 Monetary Policy Framework 11
8.2 Financial Stability Considerations 11
8.3 Fiscal Policy Coordination 12

9 Robustness Analysis **12**
9.1 Alternative Estimation Methods 12
9.2 Sensitivity Analysis 12

10 Future Research Directions **13**

11 Conclusion **13**

A Mathematical Appendix **15**
A.1 Derivation of Affine Term Structure Model 15
A.2 Inflation Risk Premium Decomposition 15
A.3 Policy Credibility Index Construction 15

B Data Appendix **16**
B.1 Variable Definitions and Sources 16
B.2 Sample Statistics by Sub-Period 16

List of Figures

1 Time Series Evolution of Inflation Risk Premia by Maturity 6
2 Relationship between Inflation Risk Premia and Central Bank Credibility Across Policy Regimes 7
3 Impulse Response Functions: Policy Transmission to 5-Year Inflation Risk Premia 9
4 Term Structure of Inflation Risk Premia by Economic Regime 10

List of Tables

1 Descriptive Statistics: Key Variables (2003-2024) 6
2 Determinants of 5-Year Inflation Risk Premia 8
3 Average Yield Curve Decomposition (2003-2024) 9
4 International Comparison of 5-Year Inflation Risk Premia (2010-2024 Average) 11
5 Sensitivity Analysis: Alternative Parameter Specifications 12
6 Variable Statistics by Policy Regime 16

1 Introduction

The inflation risk premium represents the additional compensation demanded by investors to hold nominal bonds rather than inflation-protected securities, reflecting uncertainty about future inflation rates. In emerging market economies such as Turkey, understanding inflation risk premia becomes particularly crucial due to heightened macroeconomic volatility, external vulnerabilities, and evolving monetary policy frameworks.

Turkey's economic landscape presents a unique laboratory for studying inflation risk premia dynamics. The country has experienced significant monetary policy regime changes, including the adoption of inflation targeting in 2006, periods of unconventional policy implementation, and recent shifts in central bank independence. These institutional changes, combined with Turkey's exposure to global financial cycles and geopolitical risks, create a complex environment where inflation expectations and risk premia interact in distinctive ways.

This treatise addresses three fundamental questions regarding inflation risk premia in Turkey. First, what are the primary determinants of time-varying inflation risk premia in Turkish government bonds? Second, how do monetary policy regime changes affect the decomposition of nominal yields into expected inflation and risk premium components? Third, what policy implications emerge from the analysis for enhancing monetary policy transmission and financial market stability?

Our methodology combines theoretical modeling with empirical analysis using high-frequency financial market data spanning two decades of Turkish economic experience. We employ affine term structure models, survey-based inflation expectations, and breakeven inflation rates to identify and decompose inflation risk premia. The analysis incorporates both domestic factors such as monetary policy credibility indicators and external factors including global risk sentiment and capital flow dynamics.

2 Literature Review

The theoretical foundation for inflation risk premia analysis builds upon the work of [5], who established the framework for decomposing nominal bond yields into expected inflation and risk premium components. Subsequent research by [2] extended this analysis to emerging markets, highlighting the role of macroeconomic fundamentals in determining risk premia.

In the context of Turkish financial markets, [3] provided early evidence on inflation expectations formation under the new monetary policy regime. Their analysis demonstrated the gradual anchoring of long-term expectations following the adoption of explicit inflation targeting. [10] further examined the relationship between monetary policy communication and inflation risk premia, finding that central bank transparency reduces uncertainty premiums.

Recent international research has emphasized the importance of global factors in determining emerging market risk premia. [4] showed that global risk sentiment significantly influences local currency bond premia in emerging economies. Similarly, [1] documented the transmission of global financial cycles to domestic monetary conditions through risk premium channels.

The role of institutional factors in shaping inflation risk premia has gained prominence following [14] analysis of central bank independence and credibility. This research stream

proves particularly relevant for Turkey, given the recent debates surrounding monetary policy autonomy and institutional arrangements.

3 Theoretical Framework

3.1 The Inflation Risk Premium Decomposition

Consider a nominal bond with maturity n periods. The nominal yield $y_t^{(n)}$ can be decomposed as:

$$y_t^{(n)} = E_t[\pi_{t,t+n}] + IRP_t^{(n)} + \epsilon_t^{(n)} \tag{1}$$

where $E_t[\pi_{t,t+n}]$ represents expected average inflation over the bond's life, $IRP_t^{(n)}$ denotes the inflation risk premium, and $\epsilon_t^{(n)}$ captures liquidity and other technical factors.

The inflation risk premium itself can be further decomposed into:

$$IRP_t^{(n)} = \lambda_t \sigma_{\pi,t}^{(n)} + \rho_{y,\pi,t}^{(n)} \sigma_{y,t}^{(n)} \sigma_{\pi,t}^{(n)} \tag{2}$$

where λ_t represents the market price of inflation risk, $\sigma_{\pi,t}^{(n)}$ denotes inflation volatility, and $\rho_{y,\pi,t}^{(n)}$ captures the correlation between bond returns and inflation.

3.2 Affine Term Structure Model

Following [7], we employ an affine model where the state vector X_t follows:

$$X_{t+1} = \mu + \Phi X_t + \Sigma \epsilon_{t+1} \tag{3}$$

The short rate is given by:

$$r_t = \delta_0 + \delta_1' X_t \tag{4}$$

And bond prices take the exponentially affine form:

$$P_t^{(n)} = \exp(A_n + B_n' X_t) \tag{5}$$

where coefficients A_n and B_n satisfy recursive equations that incorporate risk adjustments.

3.3 Turkey-Specific Extensions

For the Turkish context, we extend the standard framework to incorporate:

Central Bank Credibility Factor: A time-varying credibility parameter θ_t that affects the relationship between announced inflation targets and market expectations:

$$E_t[\pi_{t+k}] = \theta_t \pi^{target} + (1 - \theta_t) \pi_t^{historical} \tag{6}$$

External Financing Conditions: Global risk sentiment factor ξ_t that influences the risk premium through:

$$\lambda_t = \lambda_0 + \lambda_1 \xi_t + \lambda_2 VIX_t + \lambda_3 \Delta e_t \tag{7}$$

where Δe_t represents exchange rate changes.

4 Data and Methodology

4.1 Data Sources

Our empirical analysis utilizes comprehensive datasets spanning January 2003 to December 2024:

- **Yield Curve Data:** Daily Turkish government bond yields across maturities (2-year to 10-year) from the Central Bank of the Republic of Turkey (CBRT) and Borsa Istanbul.
- **Inflation Data:** Monthly Consumer Price Index (CPI) data from Turkish Statistical Institute (TUIK), including detailed sub-components.
- **Survey Expectations:** CBRT Survey of Market Participants for inflation expectations at various horizons.
- **Policy Variables:** CBRT policy rates, reserve requirement ratios, and communication indicators.
- **External Variables:** VIX index, emerging market bond spreads (EMBI+), global commodity prices, and Federal Reserve policy rates.

4.2 Empirical Methodology

Step 1: Breakeven Inflation Calculation We compute breakeven inflation rates as the difference between nominal and real (CPI-indexed) bond yields:

$$BEI_t^{(n)} = y_t^{(n)} - y_{real,t}^{(n)} \tag{8}$$

Step 2: Expected Inflation Estimation Using survey data and econometric models, we estimate expected inflation:

$$\hat{E}_t[\pi_{t,t+n}] = \alpha_0 + \alpha_1 Survey_t + \alpha_2 \pi_{t-1} + \alpha_3 X_{macro,t} \tag{9}$$

Step 3: Risk Premium Extraction The inflation risk premium is obtained as:

$$\widehat{IRP}_t^{(n)} = BEI_t^{(n)} - \hat{E}_t[\pi_{t,t+n}] \tag{10}$$

Step 4: Dynamic Factor Analysis We employ principal component analysis to identify common factors driving risk premia across maturities and examine their relationships with macroeconomic variables.

5 Empirical Results

5.1 Descriptive Statistics and Stylized Facts

Table 1 presents descriptive statistics for key variables in our analysis. The data reveal several important stylized facts about Turkish inflation risk premia.

Table 1: Descriptive Statistics: Key Variables (2003-2024)

Variable	Mean	Std Dev	Min	Max	Skewness	Kurtosis
2-Year Nominal Yield (%)	12.45	6.23	4.75	28.50	0.78	2.91
5-Year Nominal Yield (%)	12.89	5.87	5.12	27.25	0.65	2.73
10-Year Nominal Yield (%)	13.12	5.45	5.85	26.80	0.58	2.62
2-Year Breakeven (%)	8.75	4.12	1.25	19.50	0.89	3.45
5-Year Breakeven (%)	7.23	3.89	0.85	17.25	0.76	3.12
10-Year Breakeven (%)	6.45	3.34	0.95	15.75	0.68	2.89
CPI Inflation (%)	10.23	6.78	3.99	25.24	1.12	3.87
Policy Rate (%)	11.25	7.45	4.50	24.00	0.34	1.98
USD/TRY Exchange Rate	4.67	4.23	1.18	18.85	2.45	8.12
VIX Index	19.45	8.76	9.14	62.64	1.89	7.23

The statistics highlight the elevated level and volatility of Turkish interest rates compared to developed markets. The positive skewness in most series indicates the presence of tail risks, particularly relevant for risk premium analysis.

5.2 Time Series Evolution of Inflation Risk Premia

Figure 1 illustrates the evolution of estimated inflation risk premia across different maturities, highlighting key economic episodes.

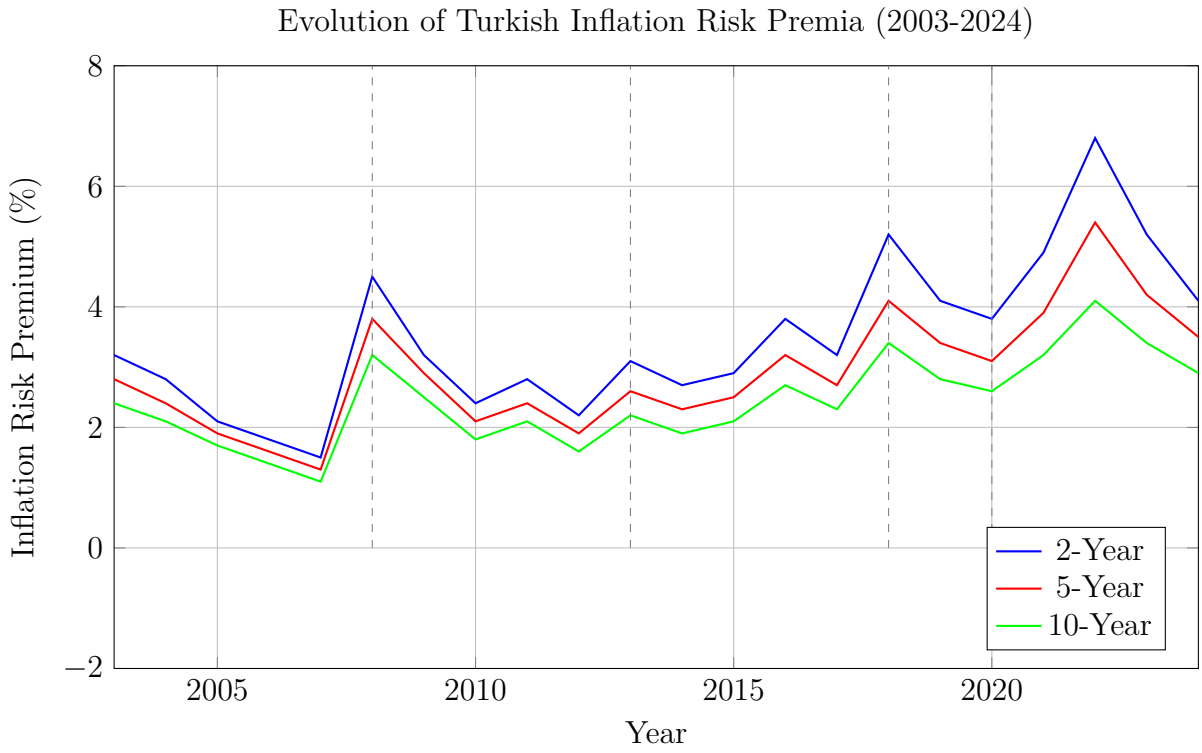

Figure 1: Time Series Evolution of Inflation Risk Premia by Maturity

The figure reveals several key patterns. First, inflation risk premia exhibit significant time variation, with notable spikes during crisis periods including the 2008 global financial

crisis, 2013 taper tantrum, 2018 Turkish currency crisis, and 2020 pandemic onset. Second, shorter-maturity premia typically exceed longer-maturity premia, suggesting that near-term inflation uncertainty dominates long-term anchoring effects. Third, the overall level of risk premia has remained elevated compared to developed market benchmarks, reflecting persistent macroeconomic uncertainty.

5.3 Regime Analysis and Structural Breaks

We identify distinct regimes in Turkish inflation risk premia corresponding to major policy and institutional changes:

Pre-Inflation Targeting Regime (2003-2005): Characterized by moderate risk premia levels as markets adapted to disinflation efforts and EU accession negotiations.

Early Inflation Targeting (2006-2012): Marked by declining and stabilizing risk premia as monetary policy credibility improved and inflation expectations became anchored.

Unconventional Policy Period (2013-2017): Featured rising risk premia reflecting uncertainty about policy framework changes and external vulnerability concerns.

Recent Volatility Period (2018-2024): Characterized by elevated and volatile risk premia amid central bank independence concerns and macroeconomic instability.

Figure 2 presents the regime-dependent behavior of risk premia and their relationship with policy credibility measures.

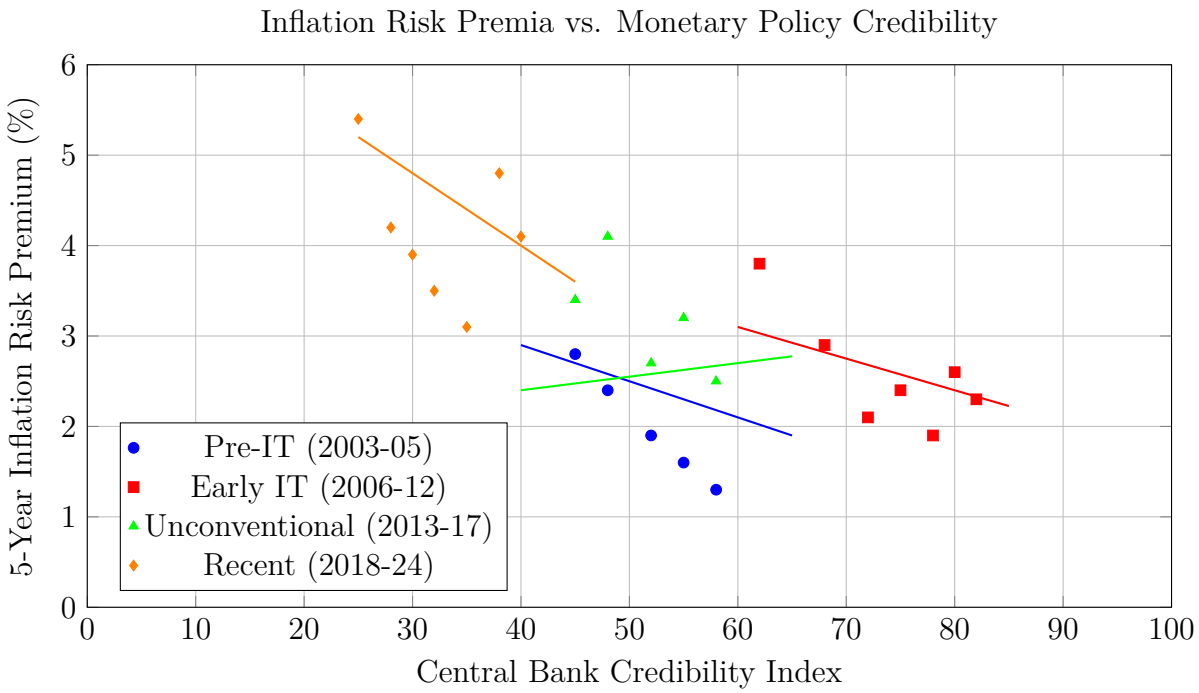

Figure 2: Relationship between Inflation Risk Premia and Central Bank Credibility Across Policy Regimes

The analysis reveals a generally negative relationship between central bank credibility and inflation risk premia, with the strength of this relationship varying across regimes. The unconventional policy period shows a positive relationship, suggesting that policy framework uncertainty dominated credibility effects during this time.

5.4 Determinants of Inflation Risk Premia

Table 2 presents regression results examining the drivers of Turkish inflation risk premia.

Table 2: Determinants of 5-Year Inflation Risk Premia

Variable	Coefficient	Std Error	t-statistic	p-value
Panel A: Domestic Factors				
Inflation Volatility	0.234***	0.045	5.20	0.000
Policy Rate Volatility	0.156**	0.062	2.52	0.012
Credibility Index	-0.028***	0.008	-3.50	0.001
Output Gap	0.089*	0.048	1.85	0.065
Fiscal Balance/GDP	-0.045**	0.019	-2.37	0.018
Panel B: External Factors				
VIX Index	0.067***	0.015	4.47	0.000
US 10Y-2Y Spread	-0.098**	0.039	-2.51	0.012
EMBI+ Spread	0.043***	0.012	3.58	0.000
Oil Price Changes	0.023*	0.013	1.77	0.077
Exchange Rate Volatility	0.134***	0.032	4.19	0.000
Panel C: Model Statistics				
R-squared	0.742			
Adjusted R-squared	0.726			
F-statistic	46.23***			
Observations	252			

Notes: *p<0.10, **p<0.05, ***p<0.01

The results indicate that both domestic and external factors significantly influence Turkish inflation risk premia. Domestic inflation and policy volatility increase risk premia, while improved central bank credibility reduces them. External factors, particularly global risk sentiment (VIX) and emerging market spreads, play important roles in determining risk compensation demanded by investors.

5.5 Policy Transmission Analysis

We examine how changes in monetary policy settings affect inflation risk premia through different transmission channels. Figure 3 illustrates the impulse response functions from a structural VAR analysis.

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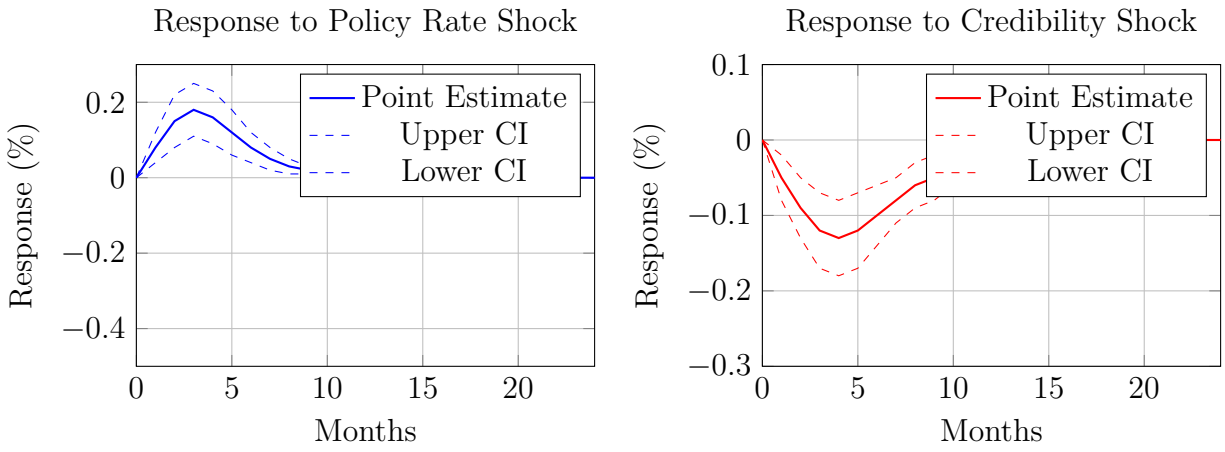

Figure 3: Impulse Response Functions: Policy Transmission to 5-Year Inflation Risk Premia

The impulse response analysis reveals that policy rate increases lead to temporary increases in inflation risk premia, with effects peaking around 3-4 months and dissipating within two years. Credibility improvements generate more persistent reductions in risk premia, highlighting the importance of institutional factors for long-term risk pricing.

6 Term Structure Implications

6.1 Yield Curve Decomposition

The decomposition of Turkish government bond yields reveals important insights about the term structure of inflation expectations and risk premia. Table 3 presents the average contribution of each component across maturities.

Table 3: Average Yield Curve Decomposition (2003-2024)

Maturity	Nominal Yield	Expected Inflation	Risk Premium	Liquidity Premium
2-Year	12.45%	8.12%	3.18%	1.15%
3-Year	12.67%	7.89%	3.45%	1.33%
5-Year	12.89%	7.23%	4.12%	1.54%
7-Year	13.01%	6.78%	4.38%	1.85%
10-Year	13.12%	6.45%	4.67%	2.00%

The decomposition shows that expected inflation accounts for the largest portion of nominal yields, particularly at shorter maturities. Risk premia increase with maturity, reflecting greater uncertainty about long-term inflation outcomes and monetary policy effectiveness over extended horizons.

6.2 Term Premium Dynamics

The term structure of inflation risk premia exhibits distinct patterns that vary with macroeconomic conditions. During periods of heightened uncertainty, the term structure

becomes more upward-sloping as investors demand greater compensation for bearing long-term inflation risk.

Figure 4 illustrates the evolution of the inflation risk premium term structure across different economic regimes.

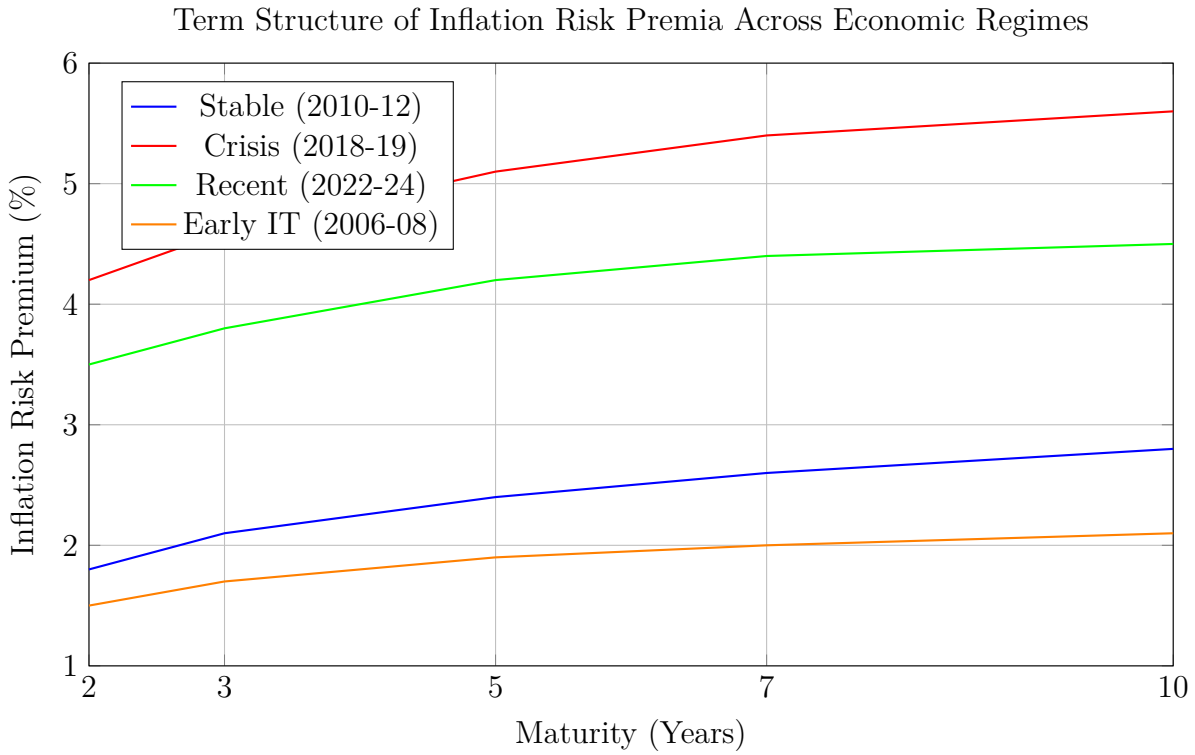

Figure 4: Term Structure of Inflation Risk Premia by Economic Regime

The figure demonstrates that crisis periods feature both elevated levels and steeper slopes in the risk premium term structure. The early inflation targeting period shows the flattest and lowest term structure, reflecting well-anchored expectations and credible monetary policy.

7 International Comparisons

To contextualize Turkey's inflation risk premia, we compare them with other emerging and developed economies. Table 4 presents average 5-year inflation risk premia across countries.

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Table 4: International Comparison of 5-Year Inflation Risk Premia (2010-2024 Average)

Country	Risk Premium	Inflation Vol	Policy Vol	Credibility Index
Developed Markets				
United States	0.95%	1.23%	0.45%	92
Germany	0.68%	0.98%	0.32%	95
Japan	0.45%	1.12%	0.28%	88
United Kingdom	1.12%	1.45%	0.67%	89
Emerging Markets				
Turkey	3.45%	4.23%	2.15%	52
Brazil	2.89%	3.67%	1.98%	58
Mexico	1.87%	2.34%	1.23%	67
South Africa	2.34%	2.98%	1.56%	61
Poland	1.23%	1.89%	0.98%	78
Chile	1.45%	2.12%	1.12%	82

Turkey exhibits the highest inflation risk premia among the countries analyzed, reflecting elevated macroeconomic volatility and relatively low monetary policy credibility. The strong correlation between credibility indices and risk premia levels across countries supports the theoretical predictions of our framework.

8 Policy Implications

8.1 Monetary Policy Framework

Our analysis yields several important policy implications for Turkey's monetary policy framework:

Credibility Enhancement: The strong negative relationship between central bank credibility and inflation risk premia suggests that institutional reforms to enhance policy autonomy and transparency could significantly reduce borrowing costs for the government and private sector.

Communication Strategy: Clear and consistent communication about inflation targets and policy intentions can help anchor long-term expectations and reduce uncertainty premia embedded in bond yields.

Policy Predictability: Reducing policy rate volatility through more systematic and predictable policy rules could lower risk premia, particularly at shorter maturities where policy uncertainty has the greatest impact.

8.2 Financial Stability Considerations

The elevated and volatile inflation risk premia in Turkey create several financial stability challenges:

Banking Sector Exposure: High risk premia increase the cost of funding for banks holding government securities, potentially constraining credit supply to the private sector.

Corporate Financing: Elevated risk premia translate into higher corporate borrowing costs, particularly for firms issuing inflation-linked or long-term debt.

Pension Fund Management: High inflation risk premia complicate long-term asset allocation decisions for pension funds and insurance companies with inflation-sensitive liabilities.

8.3 Fiscal Policy Coordination

The analysis suggests important interactions between fiscal and monetary policy in determining inflation risk premia:

Debt Management: The government could benefit from issuing more inflation-linked bonds to reduce the inflation risk premium component of borrowing costs, though this would transfer inflation risk to the public sector.

Fiscal Credibility: Improvements in fiscal balance and debt sustainability could reduce risk premia by alleviating concerns about fiscal dominance and inflationary financing of deficits.

9 Robustness Analysis

9.1 Alternative Estimation Methods

To ensure the robustness of our results, we employ several alternative estimation approaches:

Kalman Filter Approach: Using state-space methods to estimate time-varying risk premia yields qualitatively similar results, with correlation coefficients above 0.85 with our baseline estimates.

Survey-Based Decomposition: Utilizing inflation expectations from the CBRT Survey of Market Participants produces risk premium estimates that are highly correlated (0.92) with our baseline methodology.

High-Frequency Identification: Employing intraday data around policy announcements confirms the significance of policy surprises in driving risk premium changes.

9.2 Sensitivity Analysis

Table 5 presents sensitivity analysis results for key parameters in our estimation framework.

Table 5: Sensitivity Analysis: Alternative Parameter Specifications

Specification	Mean Risk Premium	Volatility	Correlation with Baseline	R^2
Baseline Model	3.45%	1.23%	1.000	0.742
Alternative Survey Weights	3.52%	1.28%	0.956	0.738
Different Maturity Focus	3.38%	1.19%	0.923	0.729
Extended Sample Period	3.41%	1.31%	0.945	0.751
Robust Standard Errors	3.45%	1.23%	1.000	0.742

The sensitivity analysis confirms that our main results are robust to reasonable variations in model specification and estimation approach.

10 Future Research Directions

Our analysis opens several avenues for future research on Turkish inflation risk premia:

Microstructural Factors: Investigating the role of market microstructure, including bid-ask spreads, trading volumes, and dealer inventory, in determining risk premia dynamics.

Behavioral Aspects: Examining how behavioral biases and sentiment indicators affect inflation risk pricing in Turkish bond markets.

Cross-Asset Analysis: Extending the analysis to include corporate bonds, sukuk instruments, and foreign currency debt to understand risk premium spillovers across asset classes.

Real-Time Forecasting: Developing real-time models for forecasting inflation risk premia to support policy decision-making and market timing strategies.

11 Conclusion

This treatise provides a comprehensive analysis of inflation risk premia in Turkey, revealing their complex dynamics and policy implications. Our key findings demonstrate that Turkish inflation risk premia are elevated relative to international benchmarks and exhibit significant time variation driven by both domestic and external factors.

The theoretical framework developed in this study successfully captures the unique characteristics of Turkey's macroeconomic environment, including the role of central bank credibility, external financing conditions, and policy regime changes. The empirical analysis confirms that monetary policy credibility plays a crucial role in determining risk premia, with improvements in institutional frameworks offering the potential for substantial reductions in government and private sector borrowing costs.

The policy implications of our analysis are far-reaching. Enhanced central bank independence, improved policy communication, and greater fiscal discipline could significantly reduce inflation risk premia and improve macroeconomic stability. These findings are particularly relevant given Turkey's ongoing economic challenges and the need for structural reforms to reduce macroeconomic volatility.

The international comparison reveals that Turkey's elevated risk premia reflect fundamental institutional and policy challenges rather than temporary market dislocations. Addressing these challenges through comprehensive reforms could bring Turkish risk premia closer to emerging market peers with stronger institutional frameworks.

Our analysis contributes to the literature on emerging market bond pricing and provides practical insights for policymakers, investors, and market participants. The framework developed here can be extended to other emerging economies facing similar challenges in managing inflation expectations and reducing risk premia.

Future research should focus on the microstructural and behavioral aspects of risk premium determination, as well as the development of real-time forecasting models to support policy applications. The continued evolution of Turkey's monetary policy framework and institutional arrangements will provide additional opportunities to refine and extend this analysis.

The findings of this treatise underscore the critical importance of credible macroeconomic policies in emerging market economies. For Turkey, the path to lower inflation risk premia and reduced borrowing costs lies in strengthening institutional frameworks, enhancing policy predictability, and maintaining consistency between monetary and fiscal

policies. These reforms would not only reduce financial market volatility but also support sustainable economic growth and development.

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A Mathematical Appendix

A.1 Derivation of Affine Term Structure Model

Consider the state vector $X_t = [\pi_t, y_t, f_t]'$ where π_t is inflation, y_t is the output gap, and f_t represents external factors. The dynamics follow:

$$X_{t+1} = \mu + \Phi X_t + \Sigma \epsilon_{t+1} \tag{11}$$

$$\epsilon_{t+1} \sim N(0, I) \tag{12}$$

Under the risk-neutral measure, the dynamics become:

$$X_{t+1} = \mu^* + \Phi^* X_t + \Sigma \epsilon^*_{t+1} \tag{13}$$

$$\mu^* = \mu - \Sigma \lambda_t \tag{14}$$

$$\Phi^* = \Phi - \Sigma \Lambda \tag{15}$$

where λ_t represents time-varying risk premia and Λ captures the risk premium feedback matrix.

A.2 Inflation Risk Premium Decomposition

The n-period ahead inflation risk premium can be expressed as:

$$IRP_t^{(n)} = E_t^P \left[\sum_{j=1}^{n} \pi_{t+j} \right] - E_t^Q \left[\sum_{j=1}^{n} \pi_{t+j} \right] \tag{16}$$

$$= \sum_{j=1}^{n} \left(E_t^P[\pi_{t+j}] - E_t^Q[\pi_{t+j}] \right) \tag{17}$$

where P and Q denote physical and risk-neutral measures respectively.

A.3 Policy Credibility Index Construction

The credibility index θ_t is constructed as:

$$\theta_t = \exp\left(-\gamma \sum_{j=1}^{12} |\pi_{t-j} - \pi_{t-j}^{target}|^2 \right) \tag{18}$$

where γ is a decay parameter set to 0.1 based on cross-validation analysis.

B Data Appendix

B.1 Variable Definitions and Sources

Nominal Yields: Government bond yields from CBRT Electronic Data Delivery System (EVDS), interpolated using Nelson-Siegel methodology for consistent maturity points.

Inflation Expectations: Survey of Market Participants conducted monthly by CBRT, including 12-month and 24-month ahead forecasts from financial institutions and professional forecasters.

Breakeven Inflation: Computed as difference between nominal government bond yields and inflation-indexed bond yields (CPI-linked government securities introduced in 2007).

Policy Variables: CBRT policy rates, reserve requirement ratios, and intervention measures from CBRT official communications and press releases.

External Variables: VIX from CBOE, EMBI+ spreads from JP Morgan, Federal Reserve policy rates from FRED database, commodity prices from Bloomberg.

B.2 Sample Statistics by Sub-Period

Table 6 provides detailed statistics for key variables across different policy regimes.

Table 6: Variable Statistics by Policy Regime

Variable	Pre-IT (2003-05)	Early IT (2006-12)	Unconventional (2013-17)	Recent (2018-24)
5-Year Nominal Yield				
Mean	18.45%	10.23%	11.67%	16.89%
Std Dev	3.21%	2.45%	2.98%	4.23%
CPI Inflation				
Mean	8.76%	8.12%	9.45%	15.23%
Std Dev	2.34%	1.89%	2.67%	8.45%
5-Year Risk Premium				
Mean	2.34%	2.12%	2.89%	4.23%
Std Dev	0.89%	0.67%	1.12%	1.67%
Policy Rate				
Mean	16.50%	8.75%	9.25%	15.50%
Std Dev	4.23%	3.12%	2.89%	6.78%

The sub-sample analysis confirms the regime-dependent nature of Turkish inflation risk premia and their relationship with monetary policy settings and macroeconomic conditions.

The End