Heteroscedasticity-Robust Quantile Regression Decomposition for Cross-Country Fiscal Multiplier Estimation Under Structural Break Regimes

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Abstract. Accurate estimation of fiscal multipliers remains a fundamental challenge in macroeconomic policy calibration, particularly across heterogeneous sovereign economies subject to asymmetric structural breaks. This study develops a heteroscedasticity-robust quantile regression decomposition framework integrating Markov-switching error correction mechanisms to isolate regime-contingent fiscal transmission channels across 47 OECD and emerging-market economies over the period 1995–2023. Employing panel-corrected standard errors alongside penalized B-spline smoothing for nonlinear trend extraction, our methodology yields multiplier estimates that are both distributional-tail-sensitive and structurally invariant. Empirical findings confirm significant multiplier heterogeneity conditioned on debt-to-GDP thresholds, monetary accommodation regimes, and output gap polarity. The framework substantially outperforms conventional OLS-based impulse response approaches in out-of-sample fiscal forecast accuracy, offering a replicable toolkit for evidence-based consolidation strategy design among policymakers navigating post-pandemic fiscal normalization.

Keywords: fiscal multiplier estimation, quantile regression decomposition, Markov-switching error correction, structural break heterogeneity, panel-corrected standard errors, sovereign debt thresholds, fiscal transmission mechanisms, output gap asymmetry, macroeconomic policy calibration

Introduction

The estimation of fiscal multipliers—the ratio of output change to an exogenous change in government expenditure or taxation—occupies a central position in contemporary macroeconomic theory and applied public finance. Despite decades of empirical inquiry, the magnitude, sign, and conditionality of fiscal multipliers remain deeply contested,

reflecting the intrinsic difficulty of identifying causal fiscal shocks in the presence of endogenous budgetary responses, cross-sectional spillovers, and time-varying macroeconomic regimes. As of 2024–2026, this uncertainty has assumed critical policy relevance: sovereign governments across both advanced and emerging economies continue to navigate the complex fiscal normalization trajectory following the unprecedented expenditure expansions of the COVID-19 pandemic era, while simultaneously confronting elevated debt-to-GDP ratios, persistent inflationary pressures, and tightened global financing conditions precipitated by major central bank tightening cycles. The conventional econometric toolkit—predominantly rooted in structural vector autoregression (SVAR) and local projection (LP) methodologies—imposes restrictive linearity assumptions that preclude the identification of state-dependent multiplier dynamics. Specifically, standard OLS-based impulse response functions fail to account for the distributional heterogeneity of fiscal shocks across business cycle phases, monetary accommodation stances, and sovereign creditworthiness gradients. This methodological gap is particularly consequential in cross-country panel settings, where unobserved heterogeneity, non-stationary fiscal trends, and regime-switching debt dynamics generate systematic heteroscedasticity that invalidates classical inference procedures. The present study addresses this gap through the construction of a heteroscedasticity-robust quantile regression decomposition (HRQRD) framework, augmented by Markov-switching error correction modules that explicitly accommodate discrete structural breaks in fiscal transmission elasticities. By operating across the full conditional distribution of output responses—rather than at the conditional mean alone—the proposed methodology captures asymmetric multiplier behavior at distributional tails, corresponding to fiscal episodes characterized by extreme austerity or stimulus under constrained monetary policy. The integration of penalized B-spline trend filtering further ensures robust decomposition of cyclical versus structural fiscal components without imposing a priori parametric restrictions on trend curvature. The empirical application draws on an unbalanced panel of 47 OECD and emerging-market economies spanning 1995 to 2023, constructed from harmonized primary balance, output gap, and expenditure cyclicality data sourced from the IMF World Economic Outlook, OECD Economic Outlook, and World Bank Fiscal Monitor databases. This breadth of coverage enables cross-regime generalizability while preserving sufficient within-country temporal variation for credible identification of regime-contingent multiplier dynamics. The remainder of this paper is structured as follows. Section 2 reviews the theoretical and empirical literature on state-dependent fiscal multipliers and motivates the HRQRD framework relative to extant methodological alternatives. Section 3 formally specifies the econometric model, detailing the quantile regression decomposition procedure, the Markov-switching error correction augmentation, and the B-spline smoothing routine. Section 4 describes the dataset construction, variable operationalization, and regime classification criteria. Section 5 presents the core empirical results, including conditional multiplier estimates stratified by debt threshold, monetary regime, and output gap polarity. Section 6 conducts robustness diagnostics encompassing out-of-sample forecast evaluation,

cross-validation under alternative bandwidth specifications, and sensitivity to structural break identification assumptions. Section 7 derives policy implications for fiscal consolidation design in the context of post-pandemic normalization frameworks. Section 8 concludes with a discussion of methodological limitations and prospective extensions to real-time fiscal monitoring systems.

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