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A Three-Factor Yield Curve Model: Non-Affine Structure, Systematic Risk Sources, and Generalized Duration

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Abstract


We assess and apply the term-structure model introduced by Nelson and Siegel (1987) and re-interpreted by Diebold and Li (2003) as a modern three-factor model of level, slope and curvature. First, we ask whether the model is a member of the affine class, and we find that it is not. Hence the poor forecasting performance recently documented for affine term structure models in no way implies that our model will forecast poorly, which is consistent with Diebold and Li's (2003) finding that it indeed forecasts quite well. Next, having clarified the relationship between our three-factor model and the affine class, we proceed to assess its adequacy directly, by testing whether its level, slope and curvature factors do indeed capture systematic risk. We find that they do, and that they are therefore priced. Finally, confident in the ability of our three-factor model to capture the pricing relations present in the data, we proceed to explore its efficacy in bond portfolio risk management. Traditional Macaulay duration is appropriate only in a one-factor (level) context; hence we move to a three-factor generalized duration, and we show the superior performance of hedges constructed using it.

Keywords: Term structure; Yield curve; Factor model; Risk Management

JEL Classification: G1, E43, E47, C5

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