

An Affine Model of Long Maturity Forward rates, with Predictable Risk Premium

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Abstract

Distantly maturing forward rates represent the markets long term (risk neutral) expectations about interest rates. As such, they are the fundamental ingredient of the pricing kernel. In most equilibrium models, interest rates mean revert, and long forward rates are asymptotically constant.

However, from US Treasury STRIPs data, forward rates slope increasingly downwards, and do not attenuate in volatility, as maturity increases beyond about 15 years. We model this in a equilibrium framework, first showing that most of the volatility in long forward rates is “short term”, coming from a predictable, tightly mean reverting factor. We verify this predictable behavior in the STRIPs data, and also in T Bond futures data. We also show that in principle, this predictability can be exploited for profit in the T Bond futures market.

Our model also includes the notion that this predictability is not present, when we transform to risk neutral probabilities. This is reasonable, since otherwise, the market would move to obviate this predictability. Also, we are able to verify this directly in the futures data, by identifying the risk neutral drift with the slope of the futures term structure.

Our model falls into the Essential Affine class, but with predictable risk premium. It is striking that this short term behavior has such a large persistent effect on the forward rates.

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