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THC has developed a new measure of volatility risk, key rate vega. The model and explanations are provided by Ho and Muduvanhu (2007) Journal of Investment management. The Feature Article briefly describes the key rate vega; Market Perspective analyzes the volatility risk of callable corporate bonds.

Feature Article: Key Rate Vega

Vega is often used by traders, portfolio manager, risk managers and other market professionals to measure the exposure of a fixed-income or derivative portfolio to interest rate volatilities. But how should the volatility risk be defined? Today, the market assumes all swaption implied volatilities increase by the same amount or a selected swaptions are used to measure the volatility risk. The former is often erroneous or misleading because the swaption implied volatilities rarely move in tandem. The latter measure is ad hoc at best.

The Ho-Mudavanhu key rate vega measures the price sensitivity of a derivative or fixed-income portfolio to the implied volatility function of the underlying arbitrage-free interest rate model. The measure is shown to be effective in describing the volatility risk of a fixed-income instrument, practical for hedging, and complete in identifying the volatility risk.

Figure 1 depicts the volatility risk profile of an at-the-money 1×10 swaption measured by key rate vegas. The swaption is sensitive to the change of volatilities at the key rates along the swap curve. The key rate vega of 1.6% at 7 year means that a 1% increase of implied volatility function at the year 7 would lead to a 1.6% increase at the price of the swaption. The precise construct of the increase is analogous to the commonly used key rate duration (Ho (1994)) in the market.

FIGURE 1

Key Rate Vegas of a 1×10 Swaption
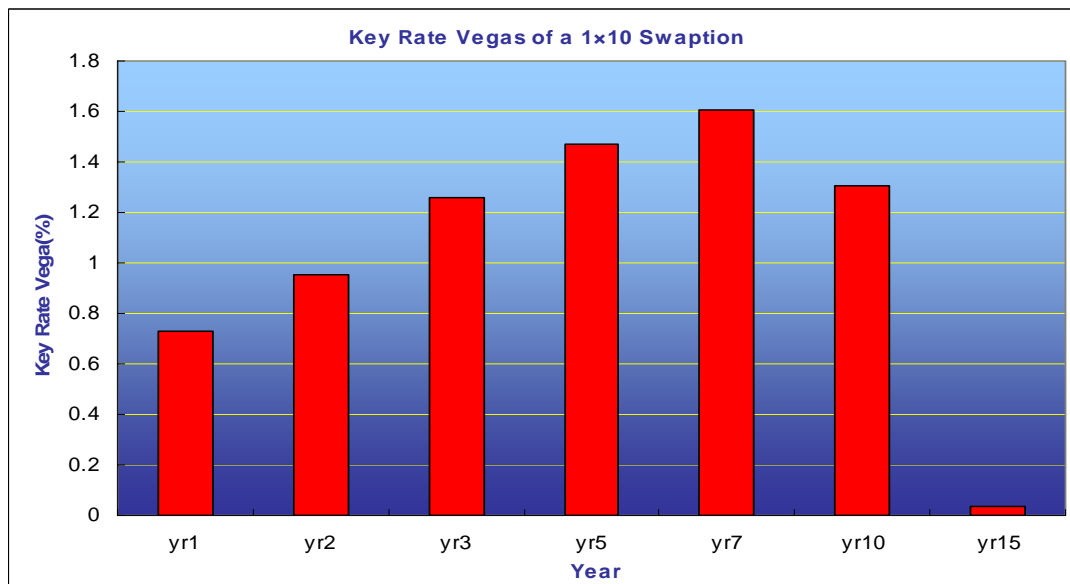
Market Perspective: Volatility Risk of Callable Bonds

A callable bond has sold an embedded call options. And therefore a rise in interest rate volatility would lead to a drop in the bond value. Figure 2 depicts the volatility risk profiles of A-Rated callable corporate bonds with coupon rate ranging from 3% to 5.75%. The characteristics of the bonds are presented in table 1 below.
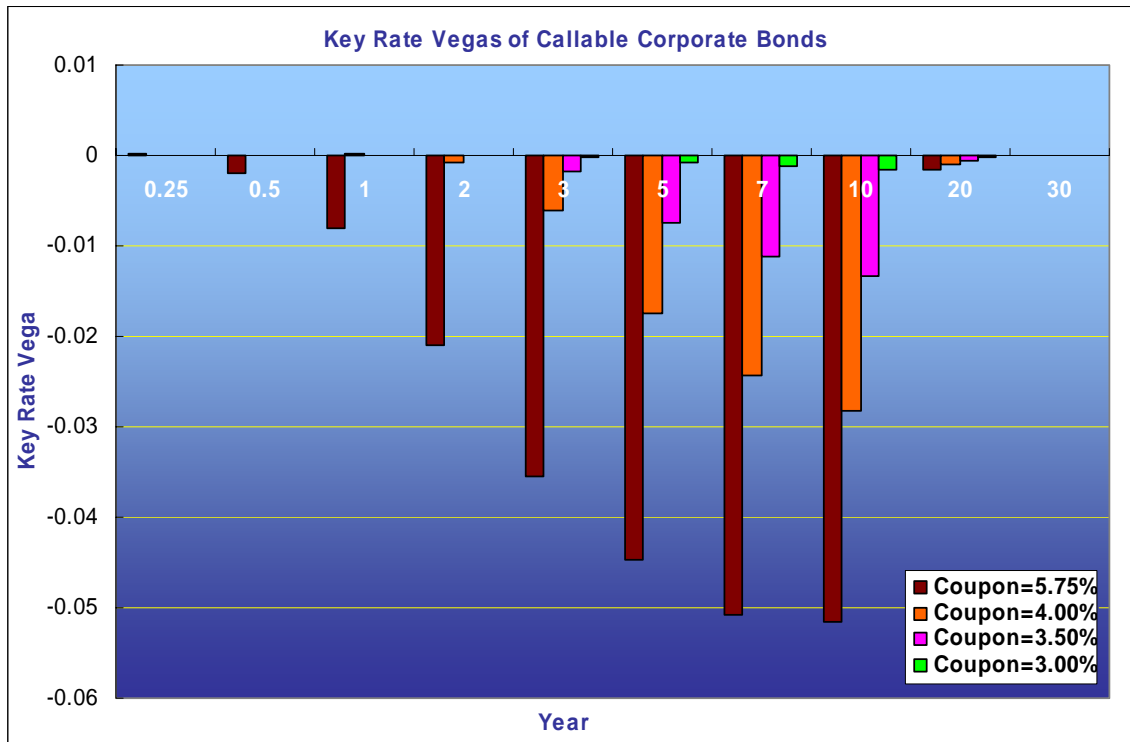
FIGURE 2

Table 1: Characteristics of the series of A-rated Callable Corporate Bonds Called at Par

Coupon	Maturity	Principal($)	Callable		
5.75/4.00/3.50/3.00 Fixed S/A Act/365	09/17/2018	100	Yes		
Call Date Schedule					
Call Date	2006-9-15	2007-3-15	2007-9-15	2008-3-15	2008-9-15
Call Date	2009-3-15	2009-9-15	2010-3-15	2010-9-15	2011-3-15

The result suggests that the risk managers can use the key rate vega to identify the risk exposure of a portfolio to the changing volatilities in the market. Portfolio managers should use swaptions and swaps to manage the combined key rate durations and key rate vegas. Often market professionals tend to manage the yield curve risk and ignore the volatility risk. Traders can use key rate vega and swaptions to exploit market opportunities. Volatilities as a market segment remain relatively unexplored.

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