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# Risk Modeling Bulletin Issue 2

## Key Rate Duration

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In this issue of the Risk Modeling Bulletin, we take a look at key rate durations and their usefulness in evaluating the effects of non-parallel shifts in the yield curve on the price sensitivity of fixed-income financial instruments. We also examine historical movements in the U.S. Treasury yield .

**Feature Article: Key Rate Durations and Non - Parallel Yield Curve Movements**

Effective duration is a measure of the price sensitivity of a financial instrument to a parallel shift in the spot yield curve. How do we measure the risk of a financial instrument to a non-parallel shift of the yield curve? For example, in the last issue, we showed that the current one-year Treasury rate is unusually high. Therefore, it would be of interest to answer the question: What would be the impact of the one-year rate falling relative to the 6-month and 2-year rates on a particular financial instrument's value or on the NPV of an institution's balance sheet?

The relevant risk measure is called the key rate duration. By definition, the nth year key rate duration measures the percentage change of the value of a financial instrument for one a percent rise in the nth year spot rate.

Consider the following key rate duration. Table 1 presents the instrument details of conventional 30-year mortgage loans and passbook accounts. Table 2 reports the key rate duration profiles of the two types of instruments. The effective durations of the mortgage loans and the passbook accounts are 5.8 and 2.7 years, respectively. The sum of all the key rate durations for mortgages and passbook accounts produces the effective durations. Given that the mortgage loans have longer effective duration, the use of savings accounts to fund these mortgage investments leads to a longer duration portfolio, as we discussed in last issue.

*TABLE 1: Details of the two instruments*

| | WAC(%) | Start Date | Maturity | Balance($ '000) | NPV($ '000) |
|---|---|---|---|---|---|
| Mortgage Loans | 6.32 | 2005-03-31 | 2034-11-30 | 621232.00 | 648283.19 |
| Passbook Account | 2.03 | ----- | ----- | 621857.00 | 553276.45 |

*TABLE 2: Key rate duration profiles*

| Key Rate Terms | 0.25yr | 1yr | 3yr | 5yr | 7yr | 10yr | 20yr | 30yr |
|---|---|---|---|---|---|---|---|---|
| Mortgage | 0.028 | 0.259 | 0.620 | 0.704 | 0.844 | 1.756 | 1.388 | 0.235 |
| Passbook | 0.400 | 0.370 | 0.570 | 0.490 | 0.388 | 0.352 | 0.096 | 0.008 |
| Net | -0.372 | -0.110 | 0.050 | 0.214 | 0.456 | 1.404 | 1.291 | 0.228 |

**FIGURE A**

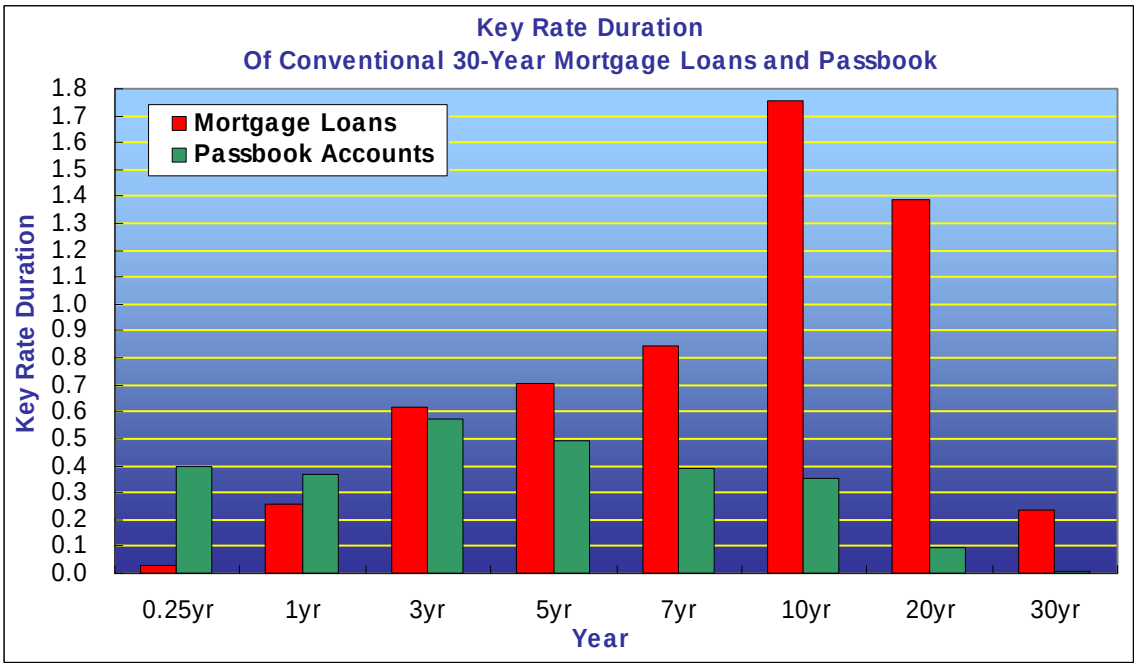


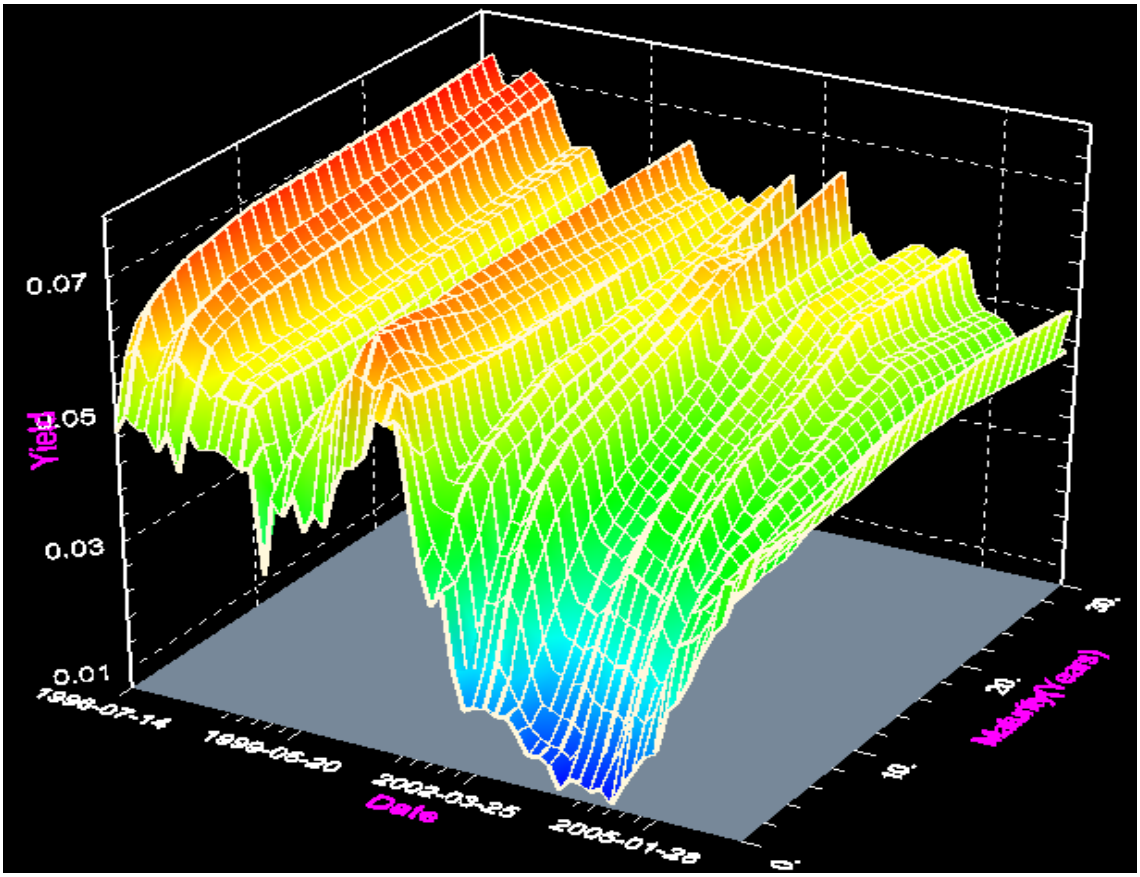

Figure 1 presents the key rate durations for the mortgage loans and passbook accounts. The 30-year fixed-rate mortgage loans have a higher effective duration than that of the passbook accounts. Moreover, the value of the mortgage loans is significantly more sensitive to the 10- and 20-year rates than the passbook account. For example, a 100 basis point rise in the 10-year rate would lead to a 1.7% drop in the value of mortgage loans, but only a 0.35% drop in the value of the passbook accounts.

If the one-year rate is expected to fall relative to the 6-month and 2-year rates, then the portfolio can be rebalanced to have a higher one-year key rate duration and lower 6-month and 2-year key rate durations.

**Market Perspective: Yield Curve Historical Movements**

Figure 2 plots the surface of yield curve movements for the period July 14, 1996 to July 14, 2006. This figure shows significant non-parallel movements of the yield curve over the 10-year period. While the yield curve is quite flat today, the potential for non-parallel yield curve movements remains significant.

**FIGURE B**

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