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Commentary

Market Opinions and Topics of Interest

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Understanding Convexity And Its Role In The Market Today

Dealers suspect that a 10-year yield of 3.75 percent, and beyond that 3.60 percent, will trigger convexity buying in Treasuries by mortgage managers hedging against prepayments. - Reuters, 3/8/04

In the wake of last week's payroll report, Treasury yields plummeted to their lowest levels since last July. Now, the question on *Wall Street* is at what level does the convexity trade begin?

The way this question is phrased makes **any answer** at best incomplete and most likely wrong. The correct answer could very well be **now**. Convexity traders started putting downward pressure on interest rates last Friday and have been active ever since. Further, the convexity trade could be as big as it has ever been (save last July). Let us explain.

(We will assume a basic knowledge of the convexity trade. An explanation of this trade was detailed in our [September 2002 Special Report](#).)

Two Types Of Convexity Traders

In the world of convexity trading, there are two types of traders:

1. **The 100% hedgers that operate much like Freddie Mac.** They do as the name implies, hedging 100% of their interest rate risk. This type of activity allows Freddie Mac to consistently report a duration gap (the difference between the duration of their assets and liabilities) of zero months (or a rounding error of +1 or -1 months). In other words, every time the market moves, they rebalance their portfolio to protect against swings in interest rates.
2. **The interest rate speculators that operate much like Fannie Mae.** These convexity traders only hedge part of their interest rate risk (or part of their "optionality" in mortgage parlance). Often they are more active when the interest rates are volatile and less active when the interest rates are range bound.

Why the difference? One word: Costs. The more one hedges the more it hurts the bottom-line. While

the 100% hedgers are fully protected from interest rate gyrations, they pay a steep price for security. The interest rate speculators, on the other hand, only hedge when necessary and are willing to accept the possibility that interest rate gyrations will hurt their operations. For this added risk, they receive more reward.

An illustration: A "0% hedger" (no hedging) enjoys a large Net Interest Margin (a measure of the cash flow from a mortgage portfolio after costs). In the current environment this could top 200 basis points. This means a financed portfolio of mortgage securities will generate a positive cash flow equal to roughly 2%.

The problem with the 0% hedgers is that they are taking a lot of interest rate risk. When interest rates change, the value of their assets (mortgages) and liabilities (financing) will also change. Given that mortgages and financing often have different characteristics (e.g., yields, maturity, duration, convexity) these changes will not offset each other. A 0% hedger will eventually become insolvent given the interest rate gyrations seen over the last few years. (This is what happened last summer at Capitol Commerce in California).

Since 0% hedging has too much inherent risk, it makes sense to reduce this risk via hedging. The goal of hedging is to make the characteristics (duration, convexity) of the assets and liabilities similar to each other. Therefore, as interest rates move, the value of one's assets (which a mortgage operation is long) and liabilities (which a mortgage operation is short) will offset each other.

The most popular hedging instrument is an interest rate swap. Typically a pay-fixed swap (or option on a swap -- swaption) is used to manage a financing (liabilities) position while a receive-fixed swap (or swaption) is used to manage a mortgage securities (assets) position.

How much hedging should one do? This is the tough question. It depends on a firm's risk/reward preference.

If one wants to completely remove interest rate risk, a **100% hedge** is necessary. In this scenario, one would buy derivatives (probably in notional amounts equal to many times their mortgage portfolio) that would convert the characteristics of their assets and liabilities to nearly identical parameters. Then when interest rates move, one side makes money and the other loses virtually the same amount. A hedge of this magnitude will cost a lot of money and greatly reduce the Net Interest Margin. Freddie Mac's Net Interest Margin would typically run around 70 to 75 basis points. So, a 100% hedged portfolio will yield 70 basis points whereas a 0% hedged portfolio will yield about 200 basis points. Completely remove the interest rate risk and the hedged portfolio will yield roughly one-third of an unhedged portfolio. This is a big hit to income. Is there another choice?

The third choice is to partially hedge. This also goes by the names "reducing optionality," "selective hedging" or "dynamic hedging." A partial hedge removes some of the risk but retains some of the Net Interest Margin. This risk versus reward calculation is what the partial hedgers constantly struggle with.

A good example of a partial hedger is Fannie Mae. Fannie Mae tells us they hedge 50% to 60% of their "optionality" (or interest rate risk). We see this through the volatility of their duration gap (which has varied between -5 and +6 months over the last year). This means their operation is leaving about half its portfolio exposed to interest rate risk. For this risk, Fannie Mae also says their Net Interest Margin is about 125 to 130 basis points – about 60% greater than the 100% hedger Freddie Mac.

Of course, the trick with partial hedging is knowing what risks to hedge, when to hedge (increase costs), and when not to hedge (reduce costs). Furthermore, one can reduce costs if the hedge is for a specific risk (i.e., rising interest rates) rather than general volatility. Making these decisions can appear to be very sophisticated but is nothing more than guessing about the future course of interest rates.

How Much Hedging Is Going On Now?

Whenever interest rates move violently, as they have in the last week, the market wonders, "when will the convexity traders 'kick in'?" To answer this question, one must understand the difference between the 100% hedgers and the partial hedgers as detailed above.

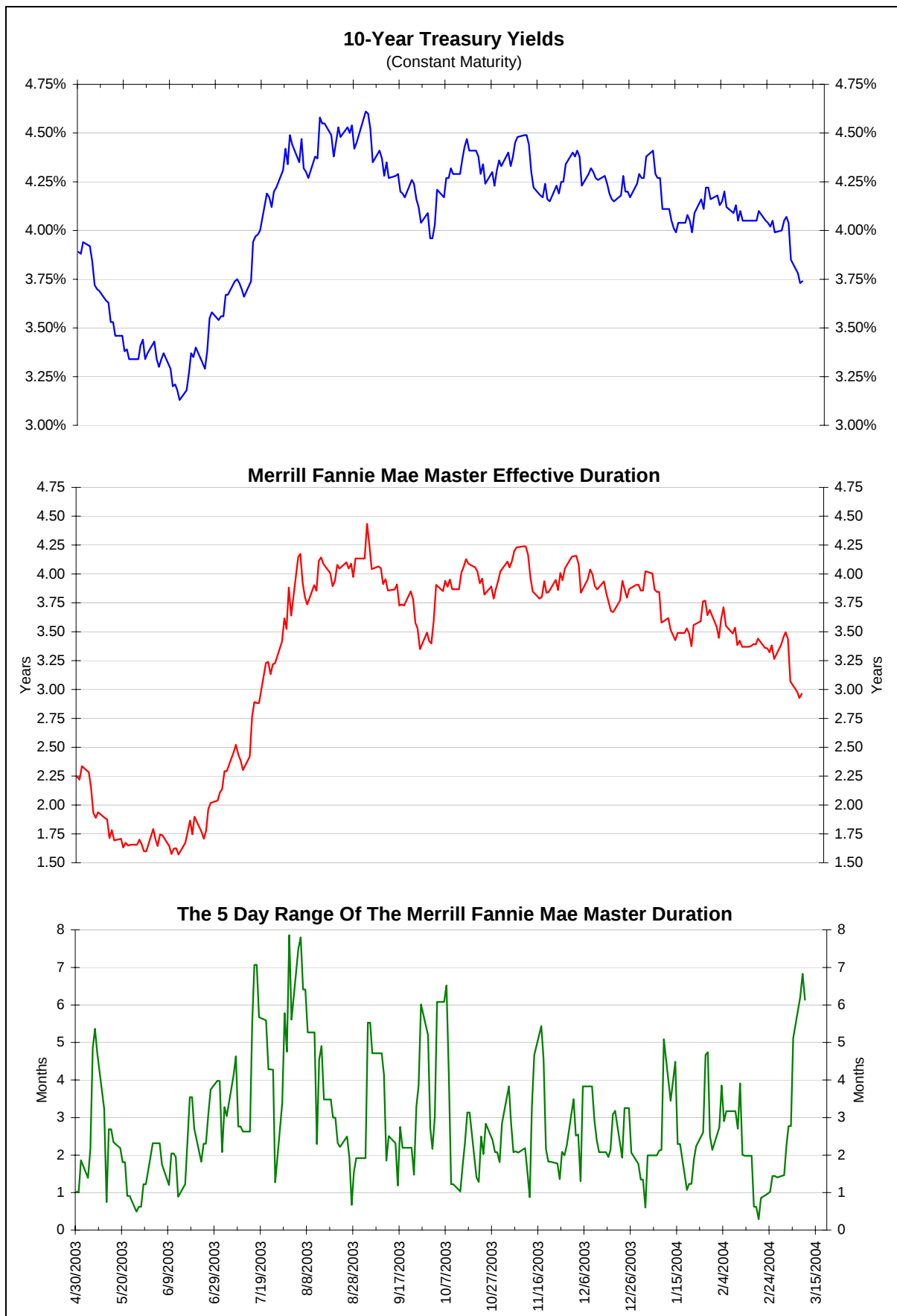
The 100% hedgers are active every day. They are constantly rebalancing their mortgage portfolios and derivatives hedges. The 100% hedgers are **always** active in the marketplace.

This does not mean they are always moving the markets. Most days their rebalancing needs are very small and have a negligible effect on the bond market. Other days, their activity can dominate the landscape. So what days is their activity large and what days is it small? Answer: It is large on the days that interest rates experience high volatility.

The charts on the next page illustrate this concept. The top panel shows 10-year Treasury yields. The middle panel shows the *effective* duration of the Merrill Fannie Mae Master Index (*effective* means assumptions about prepayments are added in. The Fannie Mae Master Index includes only mortgage securities guaranteed by Fannie Mae. This index is over half the overall Mortgage Master Index). The bottom panel is a measure of duration volatility – a rolling five-day range (highest less lowest) of the effective duration of the Fannie Mae Master Index.

Notice the similarity between the top two panels – interest rates and mortgage durations. These two series have a 96% correlation for the period shown. As interest rates change, so do the odds that a mortgage gets refinanced. So when interest rates move violently, like they did after the payroll report last Friday, mortgage durations have a similar type of move. This can be seen in the bottom panel.

Over the last five days, the effective duration of the mortgage index has decreased by over half-a-year (6.8 months). This is the largest duration move, in either direction, since last July. So, the 100% hedgers who constantly rebalance are **more active now than at any time since last July.**



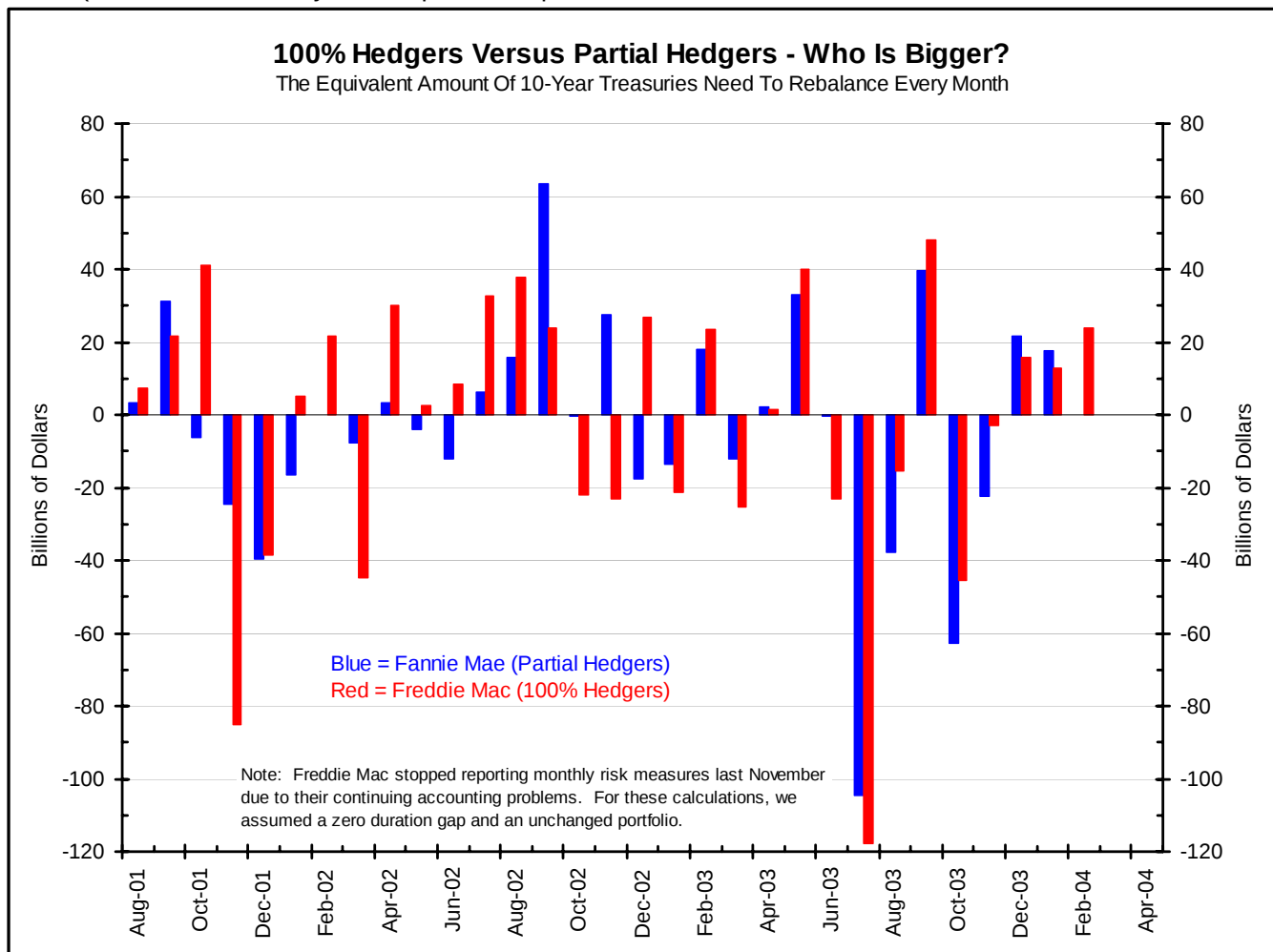
How big are the 100% hedgers? No hard numbers exist, so we must make an educated guess. To do this we examine the portfolios of Fannie Mae and Freddie Mac. They collectively own \$1.55 trillion of mortgages (as of November 2003 – the latest data from Freddie Mac). Freddie Mac, the 100% hedger makes up 42% while Fannie Mae, the partial hedger, makes up the other 58%. Therefore, we would *guess* that 40% of the convexity traders are 100% hedgers.

So, the partial hedgers are 50% larger. This is true in terms of assets, but not necessarily in terms of the market impact.

In the chart below we calculate the equivalent amount of 10-year Treasuries needed to rebalance Fannie Mae's and Freddie Mac's portfolios every month (remember, convexity traders prefer swaps to

rebalance their portfolio but the swaps traders might use Treasuries to rebalance their books). Notice that in months of extreme movements in interest rates (e.g. November 2001, July 2003, September 2003) that Freddie Mac's rebalancing needs are at least equal to Fannie Mae's rebalancing needs. Why? Because to maintain a target duration gap (zero months) forces 100% hedgers into more trading activity than a partial hedger who does not have to rebalance all the way back to zero duration gap.

This week's change in mortgage durations is the largest since last July. It is this kind of duration change that could spur waves of convexity buying among the 100% hedgers. We believe this is the case now.



Note: This chart assumes the duration and convexity of Fannie Mae and Freddie Mac's derivatives holdings is zero. While this is not true, it is reasonable to assume the actual numbers are similar to each other. To assume zero shows the maximum amount that would be needed to rebalance. In reality the actual number is somewhat less and unknowable given the lack of disclosure about their derivatives holdings.

Conclusion

On Friday, the nearby bond futures contract was up 2 9/32. This was the biggest one-day gain since January 17, 1991 – the day after the Gulf War began (we believe the futures contract is the best way to

measure daily changes in the bond market). The weak payroll report produced the best day in the bond market in over 13 years!

Market technical analysts would argue that the bond market was extremely overbought coming into this

week. Therefore the natural reaction to such a move would have been to retrace at least some of these gains.

However, since Monday, the bond market has been grinding higher while making a series of higher highs. So who is the post-payroll report buyer? Is this buyer giving the extremely long large speculators (as per our latest [CoT update](#)) someone to sell to, thus muting the typical pullback one would see after the biggest up day in over a decade?

We would argue that the 100% hedger has been active this week rebalancing. The 6-month decline in mortgage durations is enough to bring these traders out in force.

The discussion on Wall Street seems to be all about the partial hedgers. What level will trigger their buying? Most agree that they will get very active at slightly lower levels. This leaves the impression that the convexity trade is **not** an issue for the marketplace right now. It will become salient only if interest rates fall further.

We believe the 100% hedgers are out in such force that interest rates can move to the level that will "kick in" the partial hedgers. **Therefore, convexity buying is a major force in the bond market now.**

Lastly, keep in mind that the convexity trade does not start a trend - it exaggerates it. The trend lower in interest rates was in response to weak payrolls and a very accommodative Fed policy. Should rates bottom soon (in a meaningful way), it would again be due to traditional market "fundamentals" changing and the convexity buyers could very well become convexity sellers. At this moment, however, those fundamentals would have to be strong enough to overcome the convexity buying among the 100% hedgers in the marketplace.

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