

Title: Market Timing Risk in Laddering a CD Portfolio

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## **Abstract:**

A laddered portfolio of non-marketable CDs behaves differently than a laddered bond portfolio of marketable securities. Its price risk comes from early withdrawal penalties, but that penalty can also be viewed as the option price of a put. Compound interest allows the CD investor to avoid the reinvestment rate risk of coupon paying bonds.

This paper will examine market timing considerations in constructing a laddered CD portfolio of non-marketable CDs using historical data. The paper will evaluate market timing considerations at the point in the interest rate cycle that the initial funding decision is made. The focus is in the lump sum funding of a ladder versus dollar cost averaging the investments when constructing the ladder.

## Introduction:

Laddering a fixed income portfolio is an investment strategy designed to reduce market timing risk. A laddered portfolio has the investor buy equal dollar amounts of fixed income securities over a range of maturities, out to an investor determined horizon. The different maturities form the “rungs” of the ladder. As the nearby rung matures the investor reinvests the proceeds in a new security in the horizon maturity. By reinvesting in the long maturity each time a rung matures the investor buy securities at different points in the interest rate cycle. This investment discipline keeps the investor from trying to time the market, much like how dollar cost averaging purchases in the stock market avoids trying to time the market.

One problem with constructing a laddered fixed income portfolio is in the initial purchase of the rungs. If the investments are all purchased at one point in time, the investor has a different type of timing issue –he is investing the entire laddered portfolio at one point in the interest rate cycle. The dollar cost averaging benefits from the portfolio don’t come about until all the rungs have been reinvested once.

Studies have been done on the timing of stock market purchases, comparing lump-sum investment versus dollar-cost averaging. Integral to this process from a financial planning perspective is whether the investor has a lump-sum to invest, or is making periodic contributions from income, like contributions to a 401(k) or a 403(b) retirement account made with every paycheck.

The shape of the yield curve influences investors’ behavior. An upward sloping yield curve gives investors a yield pickup for investing in longer term securities that isn’t available when the curve is either flat or inverted.

Investors building a laddered CD portfolio have the choice of building it all at once, or over time. Both approaches have a measure of market timing built into the portfolio construction. The traditional CD ladder investor is buying the current yield curve and won’t be dollar cost

averaging until all the rungs have been replaced. The investor that buys rungs over time buys into the yield curve that exists at each purchase point. Key in the delayed purchase approach is how the lump sum is invested while waiting to liquidate part of the position to purchase a rung.

In this paper we will examine three alternative approaches to the traditional construction of a laddered CD portfolio: a barbell strategy where half the lump sum is kept in a short-term investment and half is kept in the longest maturity in the laddered portfolio, a short-term strategy where a lump sum is kept in the shortest maturity until used to purchase a rung at the longest maturity, and a long-term strategy where the lump sum is invested in the longest maturity of the laddered portfolio and liquidated as necessary for the periodic purchase of a rung. With this last strategy, the investor pays an early withdrawal penalty when redeeming the deposit to buy a rung. Finally, a CD portfolio is constructed that only invests in the longest maturity, in this case a five-year CD.

### **Data set:**

Data was provided by Bankrate.com. The company provided annual averages as annual percentage yields (APY's) for selected maturities of its BRM National Index from 1992-2011 and year-to-date 2012 data. See table 1 for the Bankrate data. Since there was no 4-year data available, the ladders are constructed using 1-year, 3-year, and 5-year maturities. In 1992-1999, no 3-year rates were available. The 3-year rates in the table for those years are interpolated by using the 2.5-year and 5-year CD APY's. With 20 years of data, the decision was made to consider a 15-year investment horizon and make the initial ladder purchases in the first five years of the data set. The ladders would cycle three times over the 15 year investment.

### **Ladder construction:**

The assumption is that the investor has \$100,000 to invest and wants to construct a CD ladder with a 1-year, 3-year, and 5-year maturities. While symmetrical, this ladder construction isn't as well defined as a ladder with annual maturities. It has investor purchasing five year CDs in consecutive years in some cases and with two year gaps in others. The choice was made to use a 1/3/5 ladder versus a 1/2/3 ladder because the 1/3/5 ladder would capture more of the slope of the yield curve. The \$100,000 size was based on then current FDIC insurance limit per depositor in effect in the early 1990's (Thomson 2000).

The "Traditional" approach to purchasing a CD ladder has the investor purchase equal amounts of a 1-year, 3-year, and 5-year CD at one point in time. When a CD matures, the proceeds are used to purchase a 5-year CD at the current APY. CD purchases at the ladder's inception are \$33,333.33. Later purchases are the proceeds of the maturing CD.

The "Riding the Yield Curve" approach that has the investor putting all his money to work in the five year maturity and then redeeming part of the CD at years 1 and 3 to purchase a five-year CD. The investor does pay an early withdrawal penalty on the redemption which reduces the

interest earned. Even though the initial CD purchase is \$100,000, the principal is divided into three equal dollar buckets and subsequent CD purchases of a rung are the accrued balance in a bucket less an estimated early withdrawal penalty. After reviewing Bankrate's 2012 CD early withdrawal penalty survey, which surveyed penalties in 12 markets, the early withdrawal penalties is estimated to be 270 days interest.<sup>1</sup>

The "Liquidity" approach has the investor purchase a 5-year CD at inception for \$33,333.33. The balance of the \$100,000, or \$66,666.67 is used to purchase a 1-year CD. After a year has passed, and the 1-year CD matures, half the balance is used to purchase a 5-year CD for the first rung while the other half is used to purchase a 1-year CD in year two for the second rung. When that CD matures in year three a 5-year CD is purchased for the second rung.

The barbell strategy has half the initial deposit invested in a one-year CD and half the initial deposit invested in the five-year CD. While not a CD ladder per se, this strategy is a common investment approach preserving liquidity while capturing longer term yields.

### **Comparing the investment approaches:**

Table 2 shows the interest earnings for the different investment approaches over the fifteen-year planning horizon for each of the six initial ladder construction periods. One concern in the data set is that the twenty years of data covers one of the longest bull markets for bonds in history, and a period of Fed easing from the financial crisis in 2008 onward that has kept short-term interest rates at historic lows. The trend in interest rates has been lower through much of the time period studied. Hindsight would have investors invest long. In fact the long-only strategy dominates the investment approach in all but one of the fifteen year investment cycles. Conversely, the barbell strategy returns the lowest interest earnings in all six of the fifteen year investment cycles.

A two tailed paired-t test considers the differences between two series to see if they are significant. The paired-t test shows that the "Riding the Yield Curve" and "Barbell" approaches are statistically different results from the "Traditional" approach. The Traditional approach to building a CD ladder had investment results that dominated those two approaches for all six of the fifteen-year investment cycles. In contrast the "Liquidity" approach and the "Long Only" approach were not shown to be significantly different from the Traditional approach. Paying early withdrawal penalties worked against the "Riding the Yield Curve" approach. Keeping half the portfolio liquid worked against the "Barbell" approach.

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30 months interest, a percentage of the amount withdrawn, or by the bank's replacement cost. Often there was a fee of \$25 on top of the penalty. Since most banks expressed the penalty in the form of days/months lost interest, an average of the days lost interest of 262 days was rounded up to 270 days and used to calculate the penalty for early withdrawal for the Riding the Yield Curve strategy.

### **Implications for Investors:**

The decision to not use the traditional approach in constructing a CD ladder has risks associated with the changing yield environment, as does the traditional approach. Whatever the approach, it's the change in interest rates over time that will determine whether buying in over time makes more sense than constructing the ladder all at once.

Adapting the "Riding the Yield Curve" approach to compare current 5-year CD yields with the yield on how the existing rung is invested would reduce early withdrawal penalties paid in that approach, raising total returns. Bump-up options on CDs can allow investors to capture higher yields without paying early withdrawal penalties.

**Table1 Average U.S. CD yields 1992-2012**

<b>Year</b>	<b>Index</b>	<b>3-Mo CD yield<sup>1</sup></b>	<b>1-Yr CD yield<sup>1</sup></b>	<b>2-Yr CD yield<sup>1</sup></b>	<b>2.5-Yr CD yield<sup>1</sup></b>	<b>3-Yr CD yield<sup>1,2</sup></b>	<b>5-Yr CD yield<sup>1</sup></b>
1992	BRM National Index	3.33	3.78	4.49	4.56	4.80	5.76
1993	BRM National Index	2.66	3.16	3.71	3.80	4.04	4.98
1994	BRM National Index	3.02	4.01	4.51	4.58	4.75	5.42
1995	BRM National Index	4.17	5.39	5.70	5.69	5.75	6.00
1996	BRM National Index	4.03	4.95	5.12	5.14	5.20	5.46
1997	BRM National Index	4.06	5.15	5.41	5.40	5.45	5.66
1998	BRM National Index	3.96	4.81	4.93	4.93	4.96	5.08
1999	BRM National Index	3.80	4.55	4.72	4.73	4.77	4.93
2000	BRM National Index	4.43	5.46	5.72	5.64	5.76	5.97
2001	BRM National Index	3.22	3.60	3.92	3.97	4.19	4.58
2002	BRM National Index	1.51	1.98	2.67	2.74	3.26	3.97
2003	BRM National Index	0.94	1.20	1.68	1.77	2.17	2.92
2004	BRM National Index	0.96	1.47	2.14	2.24	2.63	3.36
2005	BRM National Index	1.97	2.77	3.16	3.18	3.38	3.75
2006	BRM National Index	2.71	3.70	3.82	3.83	3.88	4.10
2007	BRM National Index	2.91	3.72	3.70	3.71	3.73	3.96
2008	BRM National Index	1.89	2.39	2.51	2.46	2.68	3.22
2009	BRM National Index	0.63	1.16	1.52	1.44	1.76	2.23
2010	BRM National Index	0.27	0.65	1.02	0.99	1.34	1.90
2011	BRM National Index	0.17	0.43	0.65	0.67	0.91	1.50
2012	BRM National Index	0.15	0.33	0.52	0.52	0.68	1.12

Source: Yields provided by Bankrate. com

- 1) These are average yields for a given year. Yields are stated as APY's.
- 2) The 3-year rates in the table for 1992-1999 are interpolated, not reported.

**Table 2: Interest Earnings over 15 year Investment Horizon**

<u>Initial Ladder</u>	<u>Traditional Ladder</u>	<u>Liquidity</u>	<u>Riding the Yield Curve</u>	<u>Barbell</u>	<u>Long only</u>
1992-1997	\$ 107,317.77	\$ 104,426.91	\$ 105,574.56	\$ 92,364.49	\$ <b>111,690.06</b>
1993-1998	\$ 94,256.09	\$ <b>96,657.05</b>	\$ 92,645.41	\$ 80,789.06	\$ 88,639.25
1994-1999	\$ <b>103,206.65</b>	\$ 104,228.12	\$ 100,279.06	\$ 83,513.08	\$ 95,378.12
1995-2000	\$ 101,120.73	\$ 105,256.15	\$ 96,605.31	\$ 90,958.99	\$ <b>114,973.30</b>
1996-2001	\$ 92,743.64	\$ 91,724.67	\$ 88,757.71	\$ 79,466.44	\$ <b>99,496.68</b>
1997-2002	\$ 88,822.39	\$ 77,127.71	\$ 84,685.23	\$ 73,424.01	\$ <b>94,278.44</b>
Average	\$ 97,911.21	\$ 96,570.10	\$ 94,757.88	\$ 83,419.35	\$ <b>100,742.64</b>

**Table 3: Paired -t test Comparing Alternatives to Traditional Ladder**

<u>Traditional Ladder</u>	<u>Liquidity</u>	<u>Riding the Yield Curve</u>	<u>Barbell</u>	<u>Long only</u>
	0.5858	<b>0.0017</b>	<b>0.0001</b>	0.2664

**References:**

*2012 CD early withdrawal penalty survey*. (2012). Retrieved from <http://www.bankrate.com/finance/cd/early-withdrawal-penalty-chart.aspx> ("2012 cd early," 2012)

Thomson, J. B. (2000). Raising the deposit-insurance limit: A bad idea whose time has come? *Economic Commentary*, Retrieved from <http://www.clevelandfed.org/research> (Thomson 2000)