Simplifying portfolio insurance

A strategy that is easy to understand, straightforward to implement, and flexible under changing conditions.

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This article offers an approach to portfolio insurance that is easy to understand and straightforward to implement. The approach does not involve complex formulas. An investor can fully understand all the trade-offs involved when specifying a strategy. At the same time, the method is flexible enough to handle even the most extreme cases. This flexibility facilitates the design of a portfolio insurance program that is consistent with the investor's objectives.

Our approach is especially well-suited to meet the needs of pension funds that do not want the value of their pension fund assets to fall below the floor defined by the present value of their liabilities.

As a strategy is managed day-to-day, the investor always knows the points at which to trade and how those points were chosen. The strategy tells the investor when it is time to trade, how much to trade, and how that trade affects the performance of his strategy.

This degree of understanding on the part of the investor fosters a highly productive relationship with the investment advisor who helps to design the strategy and with the broker who helps to implement the strategy. The investment advisor can be sure that the client completely understands the implications of each decision, so there will be no surprises. The broker can be sure that the client is aware of what the relevant trading costs are and how they will affect the strategy's performance.

SIMPLIFYING PORTFOLIO INSURANCE

Suppose you want to set a floor on the value of your portfolio, a floor that grows at the interest rate over time.

KEY CONCEPTS

$$e = mc$$

e = exposure
c = cushion
m = multiple

Floor:	Lowest value for the portfolio
Cushion:	Portfolio value minus floor
Exposure:	Amount in the active asset
Tolerance:	Percentage move that triggers a trade
Limit:	Maximum percentage of the portfolio in the active asset

You may think of your portfolio as containing an active asset and a reserve asset. The reserve asset has an acceptable minimum return, while the active asset has a higher expected return than the reserve asset. When the active asset is bonds, the reserve asset might be bills. When the active asset is common stocks, the reserve asset might be bonds. When the portfolio is part of a pension plan, the reserve asset might even be a portfolio with the same duration as the pension liabilities. Let us imagine, though, that

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the active asset is a portfolio of common stocks and the reserve asset is a portfolio of Treasury bills.

Your exposure is the amount you have invested in the active asset.

One way to set a floor on your portfolio is to invest an amount equal to the current value of the floor in bills. This amount will grow at the interest rate, so it will match the growth in the floor over time. The cushion, and only the cushion — the difference between the portfolio value and the floor — will be invested in common stocks. The exposure will be equal to the cushion.

On the other hand, this will mean putting a relatively small fraction of the portfolio in common stocks. To increase your exposure to common stocks, you can trade in a way that imitates the effect of a put option, where the option strike price is equal to the value your floor will have at the time the option expires. Imitating a put option, though, means using complex option formulas. Imitating a put option also means dealing with a specific expiration date.

The procedure described here provides a way to set a floor on your portfolio and to increase your exposure that you can use without any knowledge of option pricing theory. Furthermore, this strategy does not have a definite expiration date.

You choose your initial exposure to common stocks at some level greater than the cushion. Your multiple is the ratio of the initial exposure to the initial cushion. Each time you trade to readjust the exposure, you bring the exposure back to the same multiple of the cushion.

HOW IT WORKS

The higher the multiple, the more you will participate in a sustained increase in stock prices. Nevertheless, the higher the multiple, the faster your portfolio will approach the floor when there is a sustained decrease in stock prices. And the higher the multiple, the more you will lose when stocks move up and down or down and up.

As the cushion approaches zero, your exposure will approach zero, too. This is true no matter what multiple you are using. Normally, this will keep the portfolio value from falling below the floor. The portfolio value will fall below the floor only when there is a very sharp drop in the market before you have a chance to trade, or when you reduce exposure by shorting futures against stocks and the stocks do worse than the futures.

As the cushion rises, your exposure will approach the maximum you can have in equities, which may be 100%. During the time you are at your limit in equities, you will not be trading.

When the exposure is less than your limit, significant market moves will cause you to trade to restore the relation between exposure and the cushion. Your tolerance for market moves is the percentage move that will cause you to trade. You specify your tolerance for upward moves, and your tolerance for downward moves will be such that an up move that just causes a trade followed by a down move that just causes a trade will bring the market back to where it started.

When your tolerance is smaller, the exposure will be more precisely related to the cushion, but your turnover will be higher. More precision means higher trading costs.

Although you can think of your tolerance as a percentage move in the market, your tolerance normally is converted to a percentage move in the cushion when the strategy is executed. This allows for changes in the floor over time. The percentage move in the cushion that triggers a trade is the percentage move in the market that would trigger a trade times the multiple.

After you make a trade, you figure the new trading points for the cushion. These trading points then grow over time at the interest rate until you make your next trade.

AN EXAMPLE

Suppose that you had started to use this strategy in 1974 with a portfolio worth $100 million, a floor of $80 million, and an initial exposure to common stocks of $50 million. That means a multiple of 2.5 — $50 million divided by the cushion of $20 million.

Suppose that you decide to rebalance after a 2% increase in the market or a corresponding decrease. As 2% times 2.5 is 5%, this means you will rebalance after a 5% increase or decrease in your cushion. In practice, you will gear your rebalancing to moves in the cushion rather than to moves in the market. Assume that the full cost of the trades you do, including market impact or the effects of mispricing of futures, is 0.5% of the value of your trades.

In 1974, the market was down 26%. Our simulations suggest that the strategy would have caused you to buy twenty-five times and to sell forty times, for a total of sixty-five trades during the year. Over the year, the floor would have grown at the interest rate to $86.47 million, while the portfolio would have declined to $93.72 million. Thus, the cushion would have declined from $20 million to $7.25 million.

Over the year, total trading costs would have come to $0.38 million. Trading costs were relatively low even though it was a very bad year, because exposure to common stocks declined from $50 million

to $17.66 million during the year.

If the initial exposure of $50 million had been kept in stocks with no trading as the market moved up and down, and if the rest of the portfolio had been kept in bills, the portfolio would have declined to $91.13 million rather than to $93.72 million.

These results are summarized on the 1974 line in Table 1. That line also shows the results of two other investment strategies for comparison: a strategy that starts with just the cushion invested in stocks, and a strategy that keeps the whole portfolio invested in stocks the whole time. Similar results are given for each separate year through 1985. In each year, we assume that the portfolio starts at $100 million, the floor starts at $80 million, and the exposure starts at $50 million.

In Table 2, we show the results of the same simulation for various dates in 1986. There is one entry for each day we traded. The exposure is shown both before and after trading.

THE CONSEQUENCES

An insured portfolio is not designed to beat an uninsured portfolio in all market environments. If you

TABLE 1

Simulation Results with the Strategy Restarted Each Year
(Results are not Cumulative)

Tolerance: Rebalance after a 2% increase in S&P 500 or a corresponding decrease
Trading cost: 0.5% of amount traded

Year	Insured Portfolio	Exposure	Cushion	Floor	Buys	Sells	Trading Cost	Buy-and-Hold Strategies for Comparison		
								100 in S&P	50 in S&P	20 in S&P
Initial	100.00	50.00	20.00	80.00	—	—	—	100.00	100.00	100.00
1974	93.72	17.66	7.25	86.47	25	40	0.38	74.17	91.13	101.31
1975	122.44	92.24	37.69	84.75	26	16	0.66	137.08	121.50	112.15
1976	114.55	75.37	30.45	84.10	17	12	0.33	123.75	114.43	108.84
1977	99.13	36.88	14.85	84.28	6	12	0.12	92.70	99.03	102.82
1978	105.86	50.07	19.96	85.90	16	16	0.29	106.54	106.96	107.22
1979	113.65	64.63	25.28	88.37	14	10	0.26	118.36	114.42	112.05
1980	120.99	77.08	31.44	89.55	26	20	0.53	131.74	121.84	115.91
1981	105.37	34.10	13.57	91.80	13	19	0.23	95.39	105.06	110.87
1982	114.26	64.62	25.43	88.83	22	21	0.43	120.64	115.83	112.95
1983	115.27	69.45	28.15	87.12	14	9	0.29	122.57	115.73	111.64
1984	107.32	48.84	19.38	87.94	12	14	0.22	106.31	108.12	109.20
1985	120.61	83.63	34.42	86.19	15	8	0.28	131.38	119.56	112.46

TABLE 2

Trade Dates Between January 1, 1986, and August 6, 1986

Tolerance: Rebalance after a 2% increase in the S&P 500 or a corresponding decrease
Trading costs: 0.5% of amount traded

Date	S&P 500	Portfolio Value	Floor	Cushion	Exposure Before Trading	Exposure After Trading	Bills
12/31/85	211.28	100.00	80.00	20.00	50.00	50.00	50.00
1/09/86	206.11	98.91	80.15	18.76	48.78	46.89	52.02
1/31/86	211.78	100.54	80.50	20.04	48.18	50.09	50.45
2/10/86	216.24	101.71	80.63	21.08	51.14	52.70	49.01
2/18/86	222.45	103.33	80.76	22.57	54.21	56.43	46.90
3/11/86	231.69	105.97	81.08	24.89	58.77	62.22	43.75
3/14/86	236.55	107.33	81.15	26.18	63.52	65.46	41.87
4/04/86	228.69	105.42	81.44	23.98	63.28	59.93	45.49
4/08/86	233.52	106.71	81.48	25.23	61.19	63.07	43.64
4/16/86	242.22	109.16	81.60	27.56	65.42	68.90	40.26
4/30/86	235.52	107.42	81.78	25.64	66.99	64.10	43.32
5/23/86	241.35	109.32	82.11	27.21	65.68	68.03	41.29
5/28/86	246.63	110.85	82.17	28.68	69.52	71.70	39.15
6/09/86	239.96	109.05	82.33	26.72	69.76	66.80	42.25
6/13/86	245.73	110.73	82.41	28.32	68.40	70.77	39.94
7/01/86	252.04	112.75	82.64	30.11	72.59	75.27	37.48
7/07/86	244.05	110.41	82.72	27.69	72.88	69.23	41.18
7/14/86	238.11	108.80	82.80	26.00	67.54	64.99	43.81

would normally keep 100% in stocks, using portfolio insurance could reduce your exposure to common stocks. If the market goes up, you could outperform a 100% stock portfolio. On the other hand, if you would normally put an amount equal to the floor in the reserve asset, portfolio insurance allows you to increase your exposure to common stocks. If the market goes up substantially, the insured portfolio could outperform the alternative.

The outcome for this strategy in a given year depends mostly on how the market does during the year and on how many times you traded during the year. How many times you traded depends on the volatility of the market during the year. If the volatility is high, the portfolio value will approach the floor even if the market is unchanged for the year.

If many investors are active as buyers of portfolio insurance, they actually may affect the markets. The market may go up more than it would otherwise go up because a rise will trigger buying. It may go down more than it would otherwise go down because a fall will trigger selling. These effects may be more pronounced in the futures and options markets than in the underlying securities markets. We can model these effects by using higher trading costs than we might use otherwise.

The advantages of this strategy over other approaches to portfolio insurance are its simplicity and its flexibility. You can see what trades need to be made without using a computer. You can custom design your strategy by choosing your initial cushion, your own multiple relating exposure to cushion, and your own tolerance for market moves that are just sufficient to trigger trades. You can even change your floor, your multiple, and your tolerance to fit changes in your circumstances or changes in market conditions.