

## The Fallacy of Time Diversification

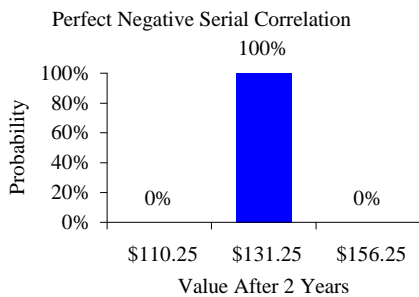
### Introduction

Time diversification is the belief that risk declines over longer investment horizons. It implies that younger investors should hold more stock in their portfolios because they have more time for future good years to offset bad years.

### When Time Diversification Might Work

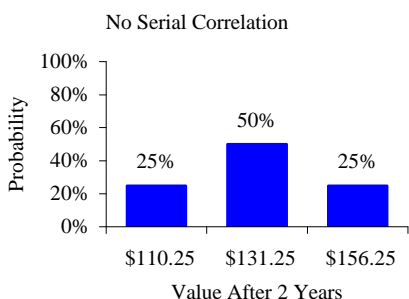
Risk declines with time horizons if above average returns are more likely to follow below average returns than above average returns. We call this negative serial correlation.

To illustrate, assume returns are equally likely to be -5% or +25% and that a -5% return is certain to be followed by a +25% return and a 25% return is certain to be followed by a -5% return. A \$100 investment will be worth \$131.25 with certainty after 2 years. Perfect negative serial correlation in this example eliminates all risk.



### Why Time Diversification Doesn't Work

If the chance of either return is independent of the prior year's observed return (no serial correlation), a \$100 investment has a 25% chance of being worth \$110.25, a 50% chance of being worth \$131.25, and a 25% chance of being worth \$156.25 after 2 years.



Nobel Laureate Paul Samuelson has shown that if returns are not negatively serially correlated, investment risk does not decline over longer horizons.

The published empirical literature finds that returns are slightly negatively serially correlated but not enough so for risk to decline over longer time horizons.<sup>1</sup> Younger investors should therefore not hold more of their portfolio in stocks, *other things equal*.

### Time Diversification Resurrected

Younger workers can more effectively vary their remaining work life and work intensity to offset below average returns than older workers. Younger workers should therefore hold more risky investment portfolios than older workers.

Those approaching retirement or already retired have little future earnings capital relative to their investments. These older investors' portfolios should be more conservative than portfolios for younger investors whose future earnings are significant relative to their investments.<sup>2</sup>

### Conclusion

According to the "age-in-bonds" rule of thumb, the percent of an average investor's portfolio invested in bonds and cash should equal the investor's age divided by 100 – with the remainder invested in stocks.

Time diversification is a fallacy. But since our remaining future earnings decline relative to our investments, our portfolios should become less risky as we age roughly as suggested by the age-in-bonds rule of thumb.

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<sup>1</sup> Averaging returns gives the mistaken impression that risk is reduced over longer periods. Variations in annualized returns over long holding periods are smaller than over shorter holding periods but the returns are being compounded over longer periods. The net effect is that risk is not reduced over longer holding periods.

<sup>2</sup> Retirees face the additional risk that below average investment returns early in the consumption phase of their investment life-cycle will require dramatic cuts in their sustainable lifestyle in order to avoid running out of assets before running out of needs.