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PRACTITIONER'S DIGEST

The "Practitioner's Digest" emphasizes the practical significance of manuscripts featured in the "Insights" and "Articles" sections of the journal. Readers who are interested in extracting the practical value of an article, or who are simply looking for a summary, may look to this section.

LIMITING INVESTMENT OPPORTUNITY SETS, ASSET PRICING, AND THE ROLL CRITIQUE

PAGE 4

Bob Korkie and H. J. Turtle

We consider the managerial and financial implications of a more complete investment opportunity set that includes very low risk assets, for any fixed investment horizon. Sequentially including very low risk assets, with the usual larger risk bonds and equities, causes the familiar mean-standard deviation hyperbola to expand to its linear asymptotes. This occurs because the global minimum variance portfolio approaches the horizon's zero risk asset's known return.

In the limit, the expanded investment opportunity set, defined by the asymptotes, substantially increases the investment opportunities but the limiting boundary portfolios are not investable. However, we demonstrate that a proxy limiting investment opportunity set is investable and, for practical purposes, is indistinguishable from the limiting set. The proxy set has multiple investable efficient portfolios with a nearly constant and maximum Sharpe ratio over a very large range of portfolio risks. This property may be extremely attractive to mean-variance portfolio managers because of the following:

- Managers may target a lower volatility portfolio with a practically equivalent Sharpe ratio.
- Previous research has shown that out-of-sample Sharpe performance is improved by selecting efficient portfolios, with lower volatility. This is caused by the reduction in the selected volatility and the reduced estimation risk for a less risky efficient portfolio's weights.
- The property eliminates the need to define and estimate the allocation weights of the tangency portfolio, with its potential data problem that occurs if the riskless rate exceeds the mean return on the vertex portfolio.
- There is no need to lever an efficient proxy portfolio with the horizon's (unobtainable) riskless borrowing rate to achieve the desired portfolio risk level. This is because larger risk, equivalent Sharpe ratio efficient portfolios are available without riskless borrowing (but may require costly short positions).

- We demonstrate that a relatively small set of well-chosen assets can effectively proxy the limiting opportunity set for many portfolios, depending on the manager's mandate.

ACCELERATING THE CAPITAL SOLUTION TO CLIMATE CHANGE PAGE 25

Yu (Ben) Meng, Anne Simpson, Anna Snider and Christina Yi Despite the marked increase in global temperatures and the number of climate-related disasters in recent years, funding for the global transition to a low-carbon economy continues to be insufficient to address this systemic risk. A lack of consistent, decision-useful data and appropriately aligned incentives has deterred many segments of the capital markets from allocating capital to the commercial opportunities in climate solutions.

In this paper we argue that although markets have been slow to recognize the premia in climate investing, recent progress in the provision of climate risk data as well as government policies that incentivize investment in clean and renewable energy and sustainable agriculture have moved us squarely beyond the inflection point in climate investing. We begin by delineating this progress, then discuss in greater detail the greenium found in investments in the transition to a low-carbon economy. We outline the bottom-up sources of the greenium, highlighting the key role of private markets with their longer-term financing and close governance alignment with investors, then discuss the top-down (system-wide) sources of the greenium. These include a market premium via carbon pricing, a commitment premium (net zero is one example) and the more recent national security premium.

We conclude with a reminder of how we have averted the Tragedy of the Commons throughout history, so that we can see a path to averting the impact of the climate crisis today. Investing in climate solutions has rapidly become an attractive commercial opportunity—and as we sit in this next era of climate investing, we must continue to think outside the rigid box.

BIOTECH ASSET VALUATION METHODS: A PRACTITIONER'S GUIDE PAGE 36

Amitabh Chandra and Sumon Mazumdar

Biotech innovations lead to the development of life-saving drugs and vaccines. However, bringing a new drug to market is an expensive, risky and time-consuming process. According to one survey, the probability that a drug that has completed pre-clinical trials, would successfully pass all three stages of clinical trials (the primary source of regulatory risk) and receive the FDA's approval to be commercialized was less than 12%, is expected to take nearly ten years on average, and cost $1.4 billion (in 2013 dollars, including the cost of compounds abandoned during testing). Biotech startups, which undertake such drug development efforts, typically have no existing revenue streams, and rely heavily on venture capitalists (VCs) for funding. This requires the VC and the startup's founders to agree on the value of the drug in development (or equivalently, the startup's value as the drug in development may be the startup's only asset).

This article is a primer on the three most common valuation methods used to evaluate biotech investments (the rNPV, VC and real option methods). As we discuss, these methods yield significantly different values because they account for a drug's regulatory risks very differently. If the VC uses

one method and the startup uses another, the startup's founders may be unwilling to give the VC the equity stake it demands in exchange for its capital contribution which could stop VC funding, and potentially prevent a company from launching a life-saving drug. It is thus critical for practitioners (biotech entrepreneurs and VCs) to understand the key drivers of value using the alternative valuation methods, and the manner in which regulatory risks are considered in each method. Understanding these differences can help biotech startups reach common ground in valuation negotiations with VCs.

Furthermore, by using a valuation method that explicitly incorporates the probabilities of success associated with each clinical trial phase (as in the rNPV method), a startup can compare bids it may receive for its biotech asset. Such bids usually include an upfront payment, and additional milestone payments that are contingent on the drug candidate successfully completing its Phase I, Phase II and Phase III trials, and additional milestone payments associated with the drug's revenue reaching a specified level. Differences in such upfront and milestone payments across bids makes it challenging for a startup to compare all bids on a apples-to-apples basis. Our practitioner's guide offers a readily implementable solution to this problem.