1FP571
Special seminar – Advanced Corporate Finance

EVROPSKÁ UNIE
Evropské strukturální a investiční fondy
Operační program Výzkum, vývoj a vzdělávání

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Risk Adjustment of CFs

Present values of expected future cash flows that enter valuation modes need to be adjusted for their inherent risk

2 philosophical approaches:

(a) Discounting risky CFs by risk-adjusted discount rate (RADR)

(b) Discounting certainty equivalents (CE) by risk-free discount rates

According to e.g. Aswath Damodaran, both approaches arrive, when properly adopted, at the same PV of CFs

Risk Adjustment of CFs

CFs' adjustment misconceptions (by Aswath Damodaran):

- expected cash flow by applying probabilities is not risk adjustment
- doing Monte Carlo simulations on the cash flows or returns do not represent risk adjustments
- arbitrary reductions in the cash flows may yield conservative estimates of values, but do not represent real risk adjustment

So, how can we adjust cash flows for risk?

- we could adjust the expected cash flows for the risk
  - a risk premium over the risk-free rate
  - risk-free discount rate applied to CE

Risk Adjustment of CFs

For those who are interested, Aswath gets by mathematically as follows:

If your expect CF in 1 year at $100 million, RADR=9% (with r_f=4%), CE for this CF is:

- risk premium component of the discount rate = (1.09/1.04)-1 = 4.81%
- CE(CF) in year 1 = $100/ 1.0481 = $95.41
- value today = CE(CF)/(1+r_f) = $95.41/1.04 = $91.74

Note that you would get exactly the same answer using the RADR approach:
Value today = E(CF)/(1+RADR) = 100/1.09 = $91.74

Put differently, unless you have a nifty way of adjusting expected cash flows for risk that does not use risk premiums that you have already computed for your discount rates, there is nothing gained in this exercise.

Risk Adjustment of CFs

Risk-adjustment of discount rates is by far the most popular method; risk is "penalized" by steeper discount rates

Things for thoughts and in favor of the concept of CE:

The rationale for the concept of discount rates is the translation of future cash flows into present value and vice versa, determining the future value of present funds, assuming the TVM

What happens, when the risk concept is imputed into discount rates? It gets automatically compounded over time.

Thus, CFs become more "risky" (less PV valuable) automatically and usually quite drastically, with no explicit control over why and reasonably how much.

Risk Adjustment of CFs

Despite truly admiring Aswath's work, ***conceptually*** I am still not fully sold to this equivalence… are you?

Risk Adjustment of CFs

Alternative concepts and thoughts of risk:

Risk as a negative or positive deviation of the expected outcome: risk or opportunity?

should a positive (appreciated) deviation of the expected result be penalized as risk, or valued as an option?

Investment risk – should there be a distinction when taking a risk of non-repayment of a loan where upside is one and downside is a net loss vs. unlimited upside for e.g. equity investors?

Risk Adjustment of CFs

Alternative concepts and thoughts of risk:

BENOIT MANDELBROT, Sterling Professor of Mathematical Sciences at Yale University and is the **pioneer of fractal geometry** and the concept of **fractal finance**

Your mutual fund's annual report, for example, may contain **a measure of risk** (usually something called **beta**). It would indeed be useful to know just how risky your fund is, but this number won't tell you. Nor will any of the other quantities spewed out by the pseudoscience of finance: **standard deviation**, the **Sharpe ratio**, variance, **correlation**, alpha, **value at risk**, even the **Black-Scholes option-pricing model**.

Risk Adjustment of CFs

Alternative concepts and thoughts of risk:

The problem with all these measures is that they are built upon the statistical device known as the **bell curve**.

This means they **disregard big market moves**: They focus on the grass and miss out on the (gigantic) trees**.**

Rare and unpredictably large deviations like the collapse of Enron's stock price in 2001 or the spectacular rise of Cisco's in the 1990s have a dramatic impact on long-term returns --but "risk" and "variance" **disregard** them**.**

Risk Adjustment of CFs

Alternative concepts and thoughts of risk:

The professors who live by the bell curve adopted it for mathematical convenience, not realism.

It asserts that when you measure the world, the numbers that result hover around the mediocre:

big departures from the mean are so rare that their effect is negligible – are they?

Risk Adjustment of CFs

Alternative concepts and thoughts of risk:

This focus on averages works well with everyday **physical variables** such as height and weight, but **not** when it comes to **finance**.

One can disregard the odds of a person's being miles tall or tons heavy, but similarly excessive observations can never be ruled out in economic life

Risk Adjustment of CFs

Alternative concepts and thoughts of risk:

The German mark's ***move from four per dollar to four trillion per dollar*** after World War I should have taught economists to beware the bell curve.

In bell-curve finance, the chance of big drops is vanishingly small and is thus ignored.

The 1987 stock market crash was, according to such models, something that could happen only **once in several billion billion** years. In power-law finance, big drops--while certainly less likely than small ones--remain a real and calculable possibility.

Risk Adjustment of CFs

Alternative concepts and thoughts of risk:

In other words, we live in a world of **winner-take-all extreme concentration**. Similarly, a very small number of days accounts for the bulk of stock market movements: Just ten trading days can represent half the returns of a decade.

The inapplicability of the bell curve has long been established, yet close to 100,000 MBA students a year in the U.S. alone are taught to use it to understand financial markets.

For those who teach finance, a number seems better than no number--even if it's wrong.

Risk Adjustment of CFs

Alternative concepts and thoughts of risk:

Professor Mandelbrot suggests the concept of fractal finance:

The term "fractal" was coined in the 1970s by one of the authors of this piece to describe the many phenomena of nature in which **small parts resemble the whole**: The veins in leaves look like branches; branches look like miniature trees; rocks look like miniature mountains.

Risk Adjustment of CFs

Alternative concepts and thoughts of risk:

To blow up an academic dogma, empirical observations do not suffice. A better theory is needed, and one exists: the **fractal theory of risk, ruin, and return.**

In this approach, concentration and random jumps are not belated fudges but the point of departure. The term "fractal" was coined in the 1970s by one of the authors of this piece to describe the many phenomena of nature in which **small parts resemble the whole**: The veins in leaves look like branches; branches look like miniature trees; rocks look like miniature mountains.

Risk Adjustment of CFs

Alternative concepts and thoughts of risk:

Another aspect of the real world tackled by fractal finance is that **markets keep the memory of past moves, particularly of volatile days**, and act according to such memory. Volatility breeds volatility; it comes in clusters and lumps.

This is not an impossibly difficult or obscure framework for understanding markets. In fact, it accords better with intuition and observed reality than the bell-curve finance that still dominates the discourse of both academics and many market players.

Risk Adjustment of CFs

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