

Equity risk

INTRODUCTION TO RISK

The risk on equity arises at many levels and situations:

- Risk on their own stock for corporations. Corporations may not have chosen the appropriate capital design, weighting debt versus equity too much or too little. Corporate may be exposed to equity risk, in the case of mergers or acquisitions. Private equity and venture capital groups bear also an important equity risk, but with very freshly or even not yet issued equity stocks.
- Risk on equity for equity stock or index position holders like funds (mutual and hedge funds), equity trading desk of banks. Also relative value trading desk also referred to as risk arbitrage desks may have important equity exposure.
- Risk on specific stocks and indexes for equity derivatives holders, like trading institution but also corporations using derivatives for various purposes like return enhancement or hedging.

Traditionally, one split the risk between

- Financial risk:
 - Market risk: any type of risk due to the market conditions and evolution. As such, equity risk, interest rates risk, and any other product risk belongs to this category as well as liquidity risk

- Model risk: this refers to the inaccurate modeling of derivatives due to modeling errors. For any non-liquid derivatives, one is doomed to have a residual model risk. The goal of financial engineers is precisely to minimize it.
- Credit risk: this relates to risk of counterparty's default, change of credit environment and so on.
- Non financial risk:
 - Operational risk: risk of running a business, risk in execution of deals and other risky business.
 - Other non-operational business risk like reputation risk, impact of a brand, depreciation risk of non-financial assets, risk on human capital.
 - Other non-directly business and financial oriented risk like political risk, economic exposure and so on.

So to cut it short, equity risk is in most cases one component of market risk. Optimal Portfolio theory aims at reducing the systemic risk in a large portfolio. Using optimization-computing techniques, it looks for the less risky portfolio (in a sense of a risk measure to be defined, often the variance) for a given return. Alternatively, it can also search numerically for the best-performing portfolio for a given level of risk (see *capital asset pricing model* and *Sharpe ratio*).

RISK IN EQUITY MARKETS

Equity markets like any other financial markets always bear an important risk in terms of market correction. Highly publicized because of financial impact, the various equity crashes (1929, 1973, 1987) have had important macro-economic consequences, general recessions and rising unemployment. For equity derivatives traders, market correction can end in big losses because of unhedgeable skew and correlation positions as well as important barrier risks, triggered by the market change.

Productivity, general outlook and general business and growth conditions are the most important factors for the overall level of the equity markets. Specific industries are also sensitive to their particular sector's competitive environment. In addition, equity markets are widely influenced by general macroeconomics factors like monetary policy of central banks and the impact of interest rate and inflation levels on business cycles.

RISK IN EQUITY DERIVATIVES MARKETS

When holding equity derivatives, the trader, investor, speculator bear an equity risk that can be quantified by risk ratio like the Greeks. The most common way of determining how many equity she is long or short is to look at the delta of the portfolio, which is the price change with respect to the equity underlyings. The delta provides a good estimates of the number of forward or futures contract to buy or sell in order to have a portfolio neutral at first order with respect to small move of the equity underlyings. However, for very convex portfolio, it is also interesting to quantify the second order risk by looking at the gamma of the portfolio. This can provide a good understanding

of the evolution of the delta as well as the break-even strategy. To gain a detailed understanding of the delta and gamma, it helps to split the risk arising from simple equity spot risk, the one from the joint move of equity spot and volatility¹, and the various cross gamma effect such as quanto and convexity correction. One may also assess the equity risk by various value-at-risk analyses. These risk scenarios are very appropriate for portfolio presenting large gap risk, as for instance capital guaranteed structure on illiquid asset and various crash puts.

EVOLUTION OF THE EQUITY DERIVATIVES MARKETS

It is true that the cross gamma risk on equity is becoming more and more relevant with the globalization of equity derivatives models. Equity derivatives markets are tailored markets to hedge or take position on a particular equity risk. In the recent years, financial institutions have developed sophisticated hybrid instrument to hedge not only equity risks but also global cross assets risks, including underlyings such as commodity, fixed income, foreign exchange, inflation, funds and credit at the same time as equity. The trend towards correlation products linking equity to foreign exchange, interest rates or other equity products, as well as credit products comes from a growing demand from private investors and retails. These latter are very keen in getting exposure to leveraged multiple asset class structures, such as composite fixed income and equity indexes, for longer dated products with

¹ This risk is very much model dependent as it is related to the assumption on the smile. This risk will change when using models with deterministic volatility,

inflation-protected capital guarantees as well as options on funds. Exotic products such as digital, range accrual and more generally barrier or callable features in guaranteed and or convertible products, with Asian and cliquet type structures as well as worst-of/best-of or Rainbow-like features are becoming more and more popular as they can answer very specific views on the markets. This increase complexity that involves development of more sophisticated models in addition to the change of regulation forces various institutions to develop or buy appropriate systems to monitor their positions and risks.

ACTIVE EQUITY PORTFOLIO MANAGEMENT

To hedge equity risk in large portfolio, one can use various tools more or less sophisticated. First, advanced versions of the capital asset pricing models based on a portfolio optimization under constraints can help to decide the appropriate asset allocation. Like for any investment strategy, there is a tradeoff between risk and return. When doing historical backtesting, it is important to use a risk adjusted performance measurement. Last but not least, over the last few years, portfolio managers have shown growing interest toward two alternatives investment decision methods: behavioral finance, emphasizing the individuality of traders and investors, and artificial intelligence expert systems analyzing millions of rules, often inspired from technical analysis to provide the best performing ones.

compared to models with stochastic volatility, jumps or a combination of the

Entry category: source of risk.

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Related articles: currency risk, interest rate risk.

Eric Benhamou²

Swaps Strategy, London, FICC,

Goldman Sachs International

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² The views and opinions expressed herein are the ones of the author's and do not necessarily reflect those of Goldman Sachs