Derivatives in Risk Management

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Abstract

Individual risk management models in accordance with the VAR methodology form the basis to manage financial risks. Bundling underlyings, designing cash flow patterns, unbundling and transferring risks associated with portfolios and creating both the desired risk profile and risk allocation of portfolios are the benefits of derivatives in a risk management environment.

Résumé

Des modèles de gestion des risques spécifiques, selon la méthodologie VAR, constituent la base pour permettre une gestion des risques financiers. Le regroupement des sous-jacents, la conception de schémas de cash-flow, la séparation et le transfer des risques relatifs aux portefeuilles, ainsi que la création du profil de risque souhaité et la répartition des risques inhérents au portefeuille, sont autant d´avantages découlant des produits dérivés dans un environnement des gestions des risques.

Keywords

Derivatives, risk management, value-at-risk, risk profile, risk allocation.

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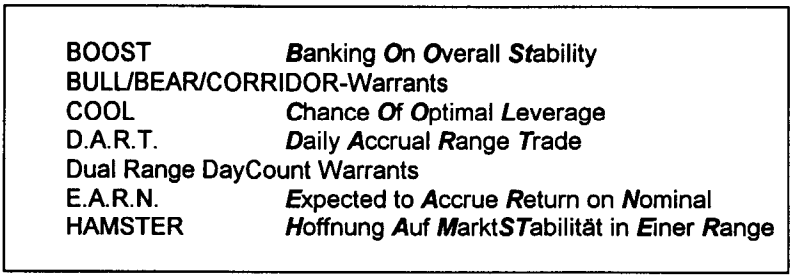
1 Introduction

The use of derivatives has expanded phenomenally over the last few years. These instruments have gained considerable importance even in Germany where they are still growing in popularity. One of the main reasons for this dynamic growth in derivatives is the necessity of investors to hedge against adverse price movements. Markets turned much more volatile following the liberalisation and deregulation of the 70's and 80's which in turn spurred a more sophisticated derivatives market.

The German Futures and Options exchange, a late entrant founded in January 1990, is now number two world-wide as measured by premium amount. The Bank for International Settlements estimated the face value of world-wide listed Futures and Options at about 8,000 Billion US Dollar in 1993. The face value of Over-The-Counter Options alone in 1995 was around 4,100 Billion US Dollars, while the growth rates of Over-The-Counter instruments in the 90's has been estimated at 700% per year.

The booming warrant market in Germany continues to expand both in the number of traded warrants and in the variety of instruments traded: At the end of 1995 there were 4,500 warrants listed in Germany. The following table contains the latest innovations in the German warrant market.

Figure 1



These innovations are " Range Warrants". Range warrants provide a return if the underlying trades within a specified trading range at expiration or during the life of the warrant. A lower or no return will be paid if the underlying trades outside the trading range.

Derivative instruments with their specific risks, fuelled by the increase in market volatility and the growth in their complexity are assuming even more importance. This is reflected in both the increased customer demand for better ways to manage financial risks and the innovative response of the financial service industry to such demand. But substantial losses in connection with the use of derivatives have occurred at such notable and varied companies as Metallgesellschaft, Gibson Greeting, Procter & Gamble, Bankers Trust, Merrill Lynch and Barings. Shaken by evidence of poor risk management and control, regulators are continually reviewing reporting requirements with a view to revealing risk exposure.

This development presents both a challenge and an opportunity to banks, financial institutions and corporates to integrate their risk management needs with regulatory requirements (European Union's Capital Adequacy Directive, CAD[1]).

The purpose of this paper is to outline the function of derivatives within a risk management environment. The risk characters of derivatives is described in section 2. Section 3 is an outline of risk types. Section 4 contains both quantitative and qualitative methods to measure and control financial risks and section 5 summarises the most important points of this paper.

2 The risk character of derivatives

Derivatives are products which " derive" their price from an underlying instrument such as an equity, an equity basket, a bond, a currency or commodity or even an index. Futures and Option contracts are normally a multiple of the underlying instrument.

The variety of more complex, customised structures would appear to be limited by the markets imagination.

On the one hand a Futures or Options contract can represent a significant multiple of the underlying instrument, and on the other hand, can be traded at a fraction of the cost of trading the underlying instrument. Therefore, these contracts are highly sensitive to

movements in the price of the cash equivalents (leveraged structure of derivatives).

An important difference between cash and derivatives is the fact that whereas cash transactions require an upfront payment, derivatives require only part payment.

Figure 2

Instrument	***Payments***
Futures	initial margin and variation margin payments
Options	premium payments (stock-style) margin payments (future-style)[2]

Derivatives facilitate the transfer of financial risks associated with a given portfolio without selling the portfolio itself. They allow investors to manage their risks and achieve both their desired risk profile and risk allocation more precisely and efficiently than any other instrument. Derivatives are not inherently speculative instruments when used as insurance against uncertainty, contrary to what one may read even in the financial press.

Both the bundling of one or more underlying instruments into one contract and transferring payments into the future are obvious benefits of these instruments. Further more the improved opportunity to

transfer or eliminate various market risks cause the efficiency of derivatives. They provide a risk management tool.

3 Risk Types

Risk can be defined as the risk of loss due to various factors related to financial markets. Risk can also be defined in terms of a flow variable, especially cash flow or earrings or results, rather than asset values.

The main financial market variables causing a special risk type are:

Figure 3

Risks	***Exposure to loss as a result of***
Market Risk	changes in the market prices
Credit Risk	a counterpart's default
Liquidity Risk	illiquid markets
Settlement Risk	delayed or wrong settlement transactions
Operational Risk	human or technological errors
Legal Risk	transactions which are not enforceable
Systemic Risk	unstability in the whole financial system
Funding Risk	mismatch between asset yields and liability funding costs[3]

4 Risk Management

Risk management is the application of both the financial analysis and various financial instruments to the control and, typically, the reduction or limitation of selected types of risk. Although there is often pressure to act or react to a given position, it is necessary to identify, understand and evaluate all aspects of the risk of financial products[4].

Value-At-Risk is a " model-based approach" that produces a summary measure of financial price risks that is both easily interpretable and theoretically defensible. VAR has become the dominant model for investors to control risk. While VAR is becoming more widely used by financial institutions and increasingly recognised by regulators, it is not yet a uniformly accepted standard. Firms operate their own valuation models in accordance with this methodology. VAR calculates, evaluates, monitors and controls financial market risks as well as risk exposures and meets the requirements of the regulators[5].

4.1 Risk Measurement

The most important measures in a risk model are the standard deviation, beta and correlation coefficient and the Greeks.

The standard deviation calculates the fluctuation of the underlying. Beta and correlation are characteristics that measure the movement of an underlying relative to the whole market. Other standardised risk

measures (Greeks) compute risk in terms of a position's sensitivity to an infinitesimal movement of the considered risk factor.

Figure 4

Standardised statistical characteristics

Standard Deviation
Beta Coefficient
Correlation Coefficient

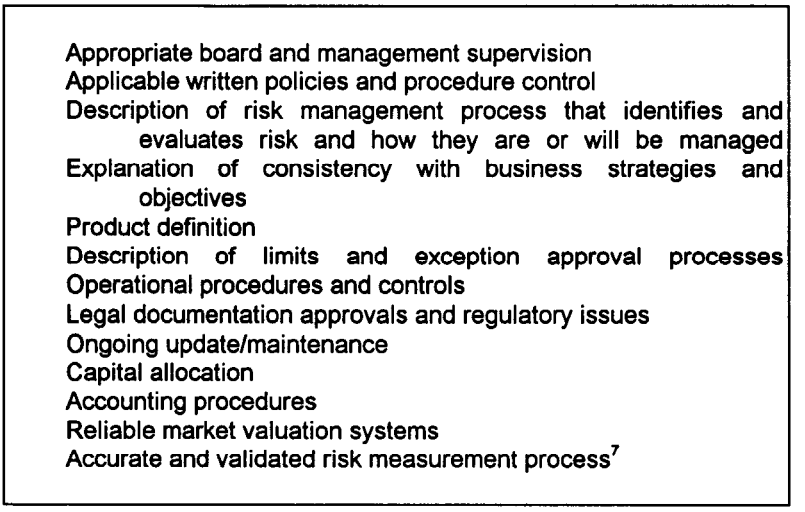
Greeks	***sensitivity of the option price due to a change in the***
Delta	price of the underlying
Gamma	delta
Vega	volatility
Theta	time to expiration
Rho	interest rate[6]

4.2 Risk Controlling

VAR is the result of a risk analysis on the basis of a mark to market valuation of positions reduced to one single number. It estimates how much value a position or portfolio might lose due to the price volatility of the relevant instrument over a particular period within a given range of statistical confidence. VAR also forms the basis for a variety of risk

management control variables and is particularly useful when employing some types of stop-loss schemes under volatile market conditions. Such risk management control variables include the following components:

Figure 5



5 Summary

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2 Hull (1993), p. 22 ff.
3 Gastineau (1992), p. 24 ff.
4 Göppl/Schlag (1995), cln. 1666 ff.; Krumnow (1993), p. 133 ff.; Krumnow (1995), p. 11 ff.
5 Matten (1995), p. 2 ff.; Matten (1995 a), p. 2 ff.
6 Hull (1993), p. 295 ff.
7 Basler Ausschuss für Bankenaufsicht (1996 a), p. 39 ff.;