Volatility says less about the future than accounting rules suggest

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Volatility says less about the Future than Accounting Rules Suggest

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"... it is surely laughable when the highest awards are showered on those who promote the most gimcrack schemes to make themselves rich, at least for a while. The geniuses who invented the pyramid of derivatives at Long-Term Capital Management were awarded the Nobel Prize for their cleverness, not long before the whole edifice came crashing down with the financial community digging deep into its pockets to prevent too much collateral damage. To every excess, there comes a reaction." *Chris Patten***

A. Introduction

Volatility regarding historical quotations is identical with the yearly statistical standard deviation. It is considered a key indicator and factor for predicting of underlying values and pricing.

The intention is to both to suggest an economic analysis and to provide some inside experience regarding the market theory to accountants. They don't seem to be aware of the model critics that are not reflected in guidance published by international accounting authorities.

A. I. Not discussed

The intention is not to discuss the Black-Scholes model in detail. Eight key disadvantages of the formula including mathematical, conceptional and economic mistakes are summarized in Schroeder (2005). Further, this paper doesn't make any statement about commercially published volatility indexes, registered as trademarks. The “real” volatility measured ex-post is used and discussed instead (backtesting).

The point is that the “real” volatility does not produce successful predictions, nor does it make sense to “estimate” future volatility for that purpose.

B. Accounting Guidance

The key rules regarding stochastic valuation methods are described in FAS 123R (US) and IAS 39 (EU) and a few other related rules. Detailed advice on a prescription level is provided by SAB 107 (US) and AG 82 (EU).

B. I. US and EU Accounting Rules

The complexity of FAS 123R e.g., its amendments and the corresponding "Staff Accounting Bulletin (SAB)" provided by the SEC and the cross referencing is unbelievable. This enables heavy bureaucratic procedures!
SAB 107[1] (SEC 3/2005) says (in response to Question 1 of Section C, Valuation Methods) "This SAB includes interpretive guidance related to share-based payment" and refers by name

- several times to the "Black-Scholes-Merton framework",
- sometimes to the lattice model[2] and
- once to Engle-GARCH forecasting techniques.

IAS39 is more vague but treacherous: When mentioning 'implied volatility' IAS39 is referring to the Black-Scholes model since implied volatility is computed by using the B-S formula in revers.

B. II. Accounting Guidance

There is quite a discrepancy and a gap between the accounting rules and the advanced financial market model discussion.

Fair value accounting (FVA) according to an ECB-definition[3] is a valuation principle that stipulates the use of either a market price, where it exists, or an estimation of a market price as the present value of expected cash flows to establish the balance sheet value of financial instruments. SAB 107 more or less suggest the use of the Black-Scholes "framework" to determine expected cash

[1] While the EU Application Guidances are part of the EU Rules and thus EU Law, SAB 107 are internal staff recommendations and will not appear in the Code of Federal Regulations. However, a firm is well advised to follow these SEC "suggestions".
[2] By "lattice model" very probably the Cox-Ross-Rubinstein Binomial-Lattice model is meant. The binomial distribution is approximated by the normal function and thus the lattice model is close to the B-S model.

flows. Thus the fair value of a call[4] is a complex[5] function of spot, exercise price, interest rate,[6] time to maturity and volatility. The term "fair value" became generally accepted in the 1980's. The original (and more correct) designation was "theoretical"[7] value.

In IAS 39, Application Guidance (AG)82, the definite list of allowed B-S variables (without mentioning the B-S model by name!) is watered down by the sentence: "*The fair value of a financial instrument will be based on one or more of the following [B-S] factors.... (....**and perhaps others.**[8]).*

There is guidance (and common economic sense) as to how these factors are defined and how actual values should be gathered from the financial markets. The discussion starts with the volatility.

The B-S "framework" requires that volatility stays constant, i. e., a current volatility then could be a good predictor of future volatility. AG 82 recommends taking as current volatility either the historic volatility of the last weeks or the so-called implied volatility. SAB 107 says the length of the historic data should be in relation and similar to the time to maturity.

The Engle-GARCH method mentioned in SAB 107 is a forecasting technique. It may have its merites in analysis of history rows, however, it is uncertain that it will hit the right future volatility figure in any individual forecasting situation to come. That is a general problem and disadvantage: Forecasting can be verified only after the facts – ex post.

Two conditions were set in the 1973 publication by Black and Scholes: „. . .*we assumed. . . that over a finite time interval the returns on a common stock are*

[3] See http:// www.ecb.int/home/glossary/html/glossf.en.html
[4] The so-called management options do not consider factors like management, success, quality etc. as influencing parameters!
[5] It is kind of presumptuous to speak of "Plain-Vanilla-Options" in the group of leveraged derivatives, computed according to the B&S differential equation.
[6] In Euroland typically Euribor- or Swap-Rates with a correspondent time to maturity
[7] It would be worth a dissertation to analyze the "fair" phenomenon. Fair -of course - sounds better than "theoretical" for marketing purposes.
[8] Emphasis by the author

lognormally distributed. . .with constant mean and volatility. . .“[9]. It's a matter of belief and tolerance whether financial data can be considered lognormally distributed. But the volatility of financial rows is volatile itself.

To overcome these drawbacks quite a number of so-called advanced models have been designed that still are based on the B-S framework. Instead of using the set of B-S factors as such these approaches model volatility and interest rate in particular. However, modeling the factors means implying further assumptions about how these factors may behave and about their future value, again meaning forecasting.

Another aspect is that the scenario of IAS valuation assumes a situation between professional businessmen (or businesswomen), i. e., "knowledgeable, willing parties in an arm's length transaction," while in Germany it is basically a situation between individual market participants — not necessarily professionals. There is different law regarding business between professionals. Buyers of derivatives are made "knowledgeable" by signing a risk disclosure. However, they still may be not aware that their shares may contain stochastic priced "values- at-risk".

B. III. Sample Case

A most simple case — in line with the international rules — would be to choose the B-S model, determine the set of B-S factors (assuming no "others"!), estimate the future volatility by using one of the methods mentioned, and "compute" the so-called fair value of a call.

This value could then become either a balance sheet item or an item in quarterly reports. It is then used instead of a market price not available for that particular item.

According to IAS, in a less simple case it could be any model using the set of B-S factors including even "others" eventually. According to SAB it should be a model related to the B-S framework.

[9] See Schroeder, G. Stochastic Pricing, p. 5 http://econpapers.repec.org/paper/wpawuwpif/0510019.htm

Pure mathematical models like the exponential-hyperbolic equation sets are excluded since they do not typically use the B-S factors that can somehow be interpreted as economic factors.

B. IV. Objections

The following objections can be raised:

a. The choosen volatility—aside from the B-S formula and related questions—may be totally wrong in a particular valuation process. There is no possibility for a proof—only ex post. The most popular interpretation is that the volatility describes a one-year bandwidth of an underlying. In case of a normal distribution 68 percent of the cases would fall in that range, in case of lognormallity only 61 percent. Paragraph C. II. "Quality of Bandwidth based Prediction" analyses this kind of prediction quality of important underlying values.

b. The fair value computed is a stochastic value, which means an expected value based on an assumed probability distribution of the returns of the underlying value; mathematically, the present value of the total product of future values and their probabilities. Referring to the German Lottery[10] case, a corresponding bandwidth around the expected value plus/minus volatility should be accepted; however, there is a difference: the 12,2 percent (6/49) theoretical probability for fair lottery bullets being drawn is derived from the lottery rules while the lognormal distribution of financial returns is just an assumption.

c. Within the B-S model there is a dependency of fair value and volatility. It describes the percentage of the fair value from one percent change of volatility.

Vega[11] (sometimes known as kappa) is the theoretical change of an option price in case of a one-percent change in volatility. Vega is used for hedging volatility risk. In this case it ranges from 8 to 23 percent independent of call or put.

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for a more detailed discussion.

[10] Refer to Lottery Findings as of 2005, p. 14.

[11] Vega is part of the "Greeks" despite it is not a Greek character. The "V" refers to volatility.

The following table indicates the (ex post) measured average impact an increase of volatility would have had on fair values of approximately 1000 exchange rate options "at-the-money" (Euro/Dollar, 1985 - 2005):

Figure 1: Measured Impact of Volatility Changes[12]

Volatility	Call	Put
1%	7%	12%
2%	13%	23%
3%	19%	33%
4%	25%	42%

While in theory Vega should be identical for calls and puts the empirical measure shows that the impact on puts is significantly higher.

In either aspect, as long as B-S-type models are used volatility is the most important factor.

d. Details of the valuation model used in an individual case don't require publishing. The accounting firm, the tax inspector and a rating agency involved may be the only ones who know. And (of course) "knowledgeable, willing parties in an arm's length"[13] situation may ask for the valuation model and how the factors are used. All others are barred from this insight.

Summarizing these arguments, it must be said: there is no proven technique to predict a future volatility (volatility is rather volatile itself), there is no reason that the volatility should influence the price of an option, and the B-S model should not be used because its prerequisites do not meet reality.

A valuation model based on fair value is pure fiction. A changing swell doesn't change the depth of the sea.

B. V. Does Volatility Say Anything about the Future?

Yes. Volatility of stock indexes is higher than foreign exchange volatilities, which are around 10 percent (among the dollar, euro, yen and British pound).

[12] See Schroeder, G., Stochastic Pricing, 2005, p. 6
[13] A term used in IAS 39, AG70

Volatilities between the euro and the Swiss frank are around 5 percent, between the euro and the Danish krone is around 2 percent. But they are administered, "smoothed"; Denmark, e.g., has to maintain that bandwidth for the last two years as long as it wants to opt for the euro[14].

Volatilities of stock indexes are on the other hand around 15 percent or more.

Looking at the history volatilities there have been minima and maxima, averages, etc., which are quite stable. This scenario may be valid for a couple of years.

The volatility of volatilities themselves is typically similar to that of underlying values.

C. Objections based on Basic Statistics

C. I. Standard Deviation Vs Bandwidth

In case of exchange quotations The standard deviation (sigma) is a statistical measure of the spread of the courses or their returns in a diagram. If a variable follows a normal probability distribution 68 (not 100!) out of any 100 randomly selected cases or quotations should fall within the range of mean plus/minus sigma (Fahrmeir, 2001, p. 92). Thus the yield of positive predictions is also a measure for the prediction quality of volatility. Any other probability function has another quota of hits.

The broader the range, i. e., the greater the volatility, the more hits can be counted—however, the less interesting for predictions.

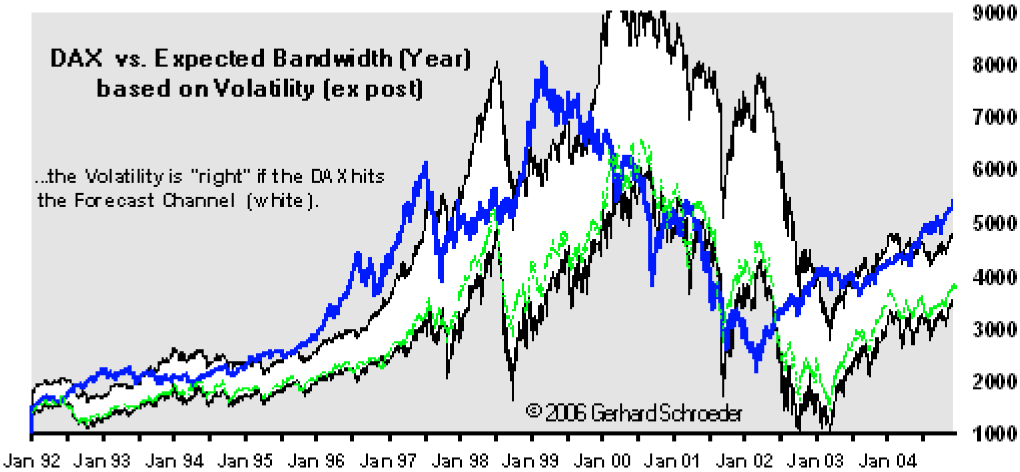
Since the future development (and the probability distribution) of an underlying value is unknown, its standard deviation — observed in the past — is often used to determine a future bandwidth. If done day by day one can draw a forcasting channel based on all individual bandwidth figures, though it is still an assumption or belief. It is different from Lotto or dice where physical and mathematical rationales suggest a certain probability in the long run.

[14] This may not happen either since the portait of Magrethe II is not allowed on the euro frontside.

Most of the financial market models — again — assume rather the lognormal distibution of returns. This distribution has a specific property: there is the same probability to double or to halve a course,[15] etc.

When forecasting underlyings the last quotation (S or spot) is taken as the mean since this is the "best predictor" for any future course development. For both present and future it is not possible to be sure about the standard deviation. Since the future standard deviation is unknown, the implied volatility (*ivol*) is often taken as an estimator instead. Thus the positive end of the bandwidth is assumed to be *spot x (1+ ivol)*. In this case the negative end is defined by last $spot/(1+ivol)$ (Green Line)

Figure 2: Volatility based DAX Predictition



Thus the lognormal bandwidth is smaller than $spot*(1\pm ivol)$ and less than 68 out of any 100 randomly selected cases, the higher the volatility the more quotations will fall within the bandwidth. In case of 15 (30) percent volatility it is 64 (62) hits, etc.

Counting 3263 daily DAX quotations the ex post volatility was used to determine the bandwidth for each day over 252 exchange days, representing an average year, or 21 bank days (for a month). This determines a forecast channel.

[15] Economically this has some rational. Courses cannot become negative. In absolute terms: Less market power is required to bring courses 5 points up than 5 points down.

Figure 1 suggests that the forecast channel was somewhat "behind", for example during '95 through '97. In this diagram the forecast and the future course (bold blue line) are related to the day of forecast. It would be plausible also to relate it to the time of prediction (actual course versus what was predicted?). However, that would not change the graph. It would shift the x-scale only. An explanation for the volatility lag could be that the course moves must happen first to "make" the volatility. For similar figures covering DJ, FTSE, USD/EUR please refer to page 18.

C. II. Quality of Bandwidth based Prediction

Some leading indexes, the Euro-Dollar relation and a heavy traded stock are taken as examples:

Figure 3: Prediction Precision

Volatility	1 Year in Days	Hits as %	from	to	Average Volatility
DAX ex post	252	46%	1992	2004	18%
lognorm corrected	252	44%	1992	2004	18%
FTSE ex post	252	53%	1984	2004	16%
DJ ex post	252	54%	1987	2004	14%
Euro in USD e.p.	**365**	47%	1999	2005	10%
Telekom ex post	252	78%	1996	2004	42%

The closer the number of hits comes to a "50/50" result, the more prediction validity becomes meaningless. As far as all hits making less than 68 percent, this also proves that these probability distributions deviate from normal! The Telekom yield is an excemption: The 78 percent is also a deviation from normal standards, however positive. This is a result of the high level of overall volatility during the full sample period.

C. III. Predicting a Single versus a Value Bandwidth

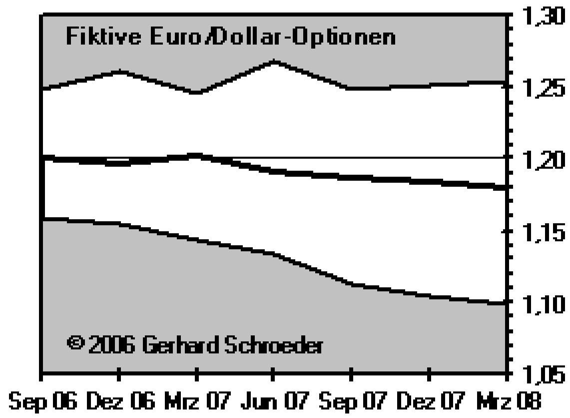
It is insufficient for reports or balance sheets to declare the bandwidth of a value (value-at-risk approach). Single values are achieved by multiplying probabilities with the scale of potential value. The sum of the products is called the expected value. To identify and to quantify risks arising from market and stochastic uncertainties, levels of volatility are determined in risk statements.

C. IV. Expected Courses Based on Options

Besides volatility one could analyze option prices that at least theoretically contain individual course expectations to cover the compound interest for the option. Or one could follow auto correlative structures of historical and present quotations.

Instead of evaluating option prices via the volatility for putative future share values one could compute the accrued option price including transaction costs at time due.

Figure 4: Option-based Prediction



The boundaries of the white channel represent the break-even line of calls and puts, respectively.

In the event the course reaches the top grey area it would be profitable for calls (the bottom grey area for puts). The white area indicates course developments without profits for either puts or calls.

The bold black line in the middle represents the expected course computed out of call and put expectations weighted by their price. There are different weighting techniques possible, each option buyer bets on a certain course — at least when he or she operates "rationally." Options with different exercise prices but the same due date could be combined easily. Thus all option courses for the same underlying and the same due date can be weighted by the courses.

More representative weighting would include the inventory of options of major brokerage banks or, even better, all quotes of the total trade of options of all option exchanges in place including OTC. That would include those market participants who are tracking the particular course but decide not to react but are at least on "keep" or "hold". This would more or less represent the value expectations of the retail market.

When emitters cover their risks caused by any imbalance between call- and put-type orders then they may influence stock courses also. Thus, proprietary positions should be included also, especially in the case of micro hedging or "naked sales", when they foil trends assumed by the market originally for the options or the underlying values.

It is quite questionable whether the retail market and the emitters really care about the correct and most probable future values. They rely on models to determine the option prices based on current market data. In approximately 90 percent of the cases it is the Black-Scholes model.

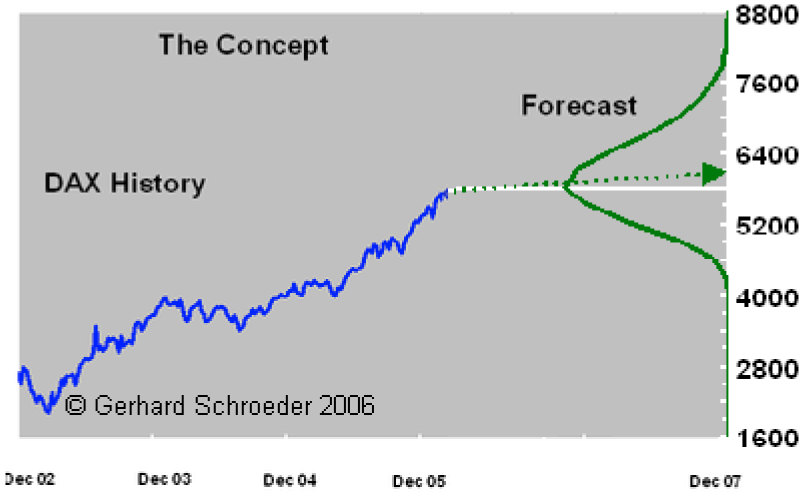
C. V. Expected Courses Based on Pure Volatility

The future value of the expected underlying value based on lognormal distributed returns (see page 10f.) deducted by the exercise price and discounted could be taken for an aproximation of a call price also. In this case there are no approximations of put prices since there are no negative lognormal expectations. This would still allow underlying values with lognormal returns to reach a level making puts profitable during the time before expiration .

C. VI. Lognormality

Assuming that future returns follow a lognormal density distribution the spread of future courses can be shown as in the following figure. The volatility for the time from January 2006 until December 2007 has to be estimated. Approximately 15 percent (per year) is assumed.

Figure 5: The Concept

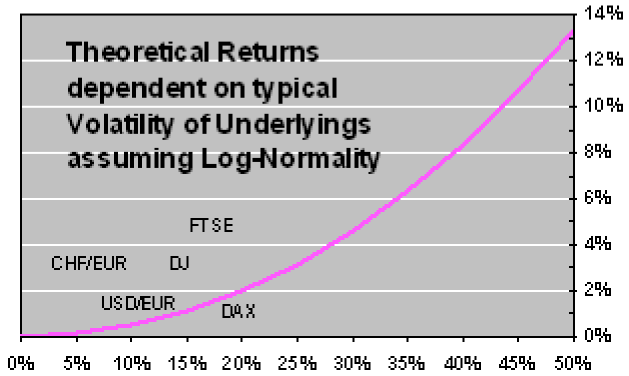


The time of prediction is the end of January 2006, with the most recent quotation of about 5800. This is — assuming an effective market — the most probable quotation for Dec. 07 also. Thus the peak of the density curve is at 5800 with a maximum probability of 18 percent (w/o scale). Applying the density curve over the DAX-scale puts the "expected" value of the DAX at around 6000. Seventy-three of 100 cases might fall within the range of 5200 through 6400, which is quite vague and still leaves 27 cases outside. The expected performance is between 1 and 2 percent per year (depending on the volatility), which is precious little for a blue chip index. It is only because of the mild skewness of the density curve, there is no economic reason. More precisely a variable X can be named lognormal with parameters mean and square sigma, in short, *X ~ LN (mean, sigma^2)* as long as *Y = Ln (X)* is distributed normally. The expected value of X is then:

E(X) = EXP(mean + 0,5 sigma^2) = EXP(mean + 0,5* variance)*

The theoretical dependency of returns (y-axis) on the long term average volatility (x-axis) is shown in the following diagram:

Figure 6: LN Returns versus Volatility



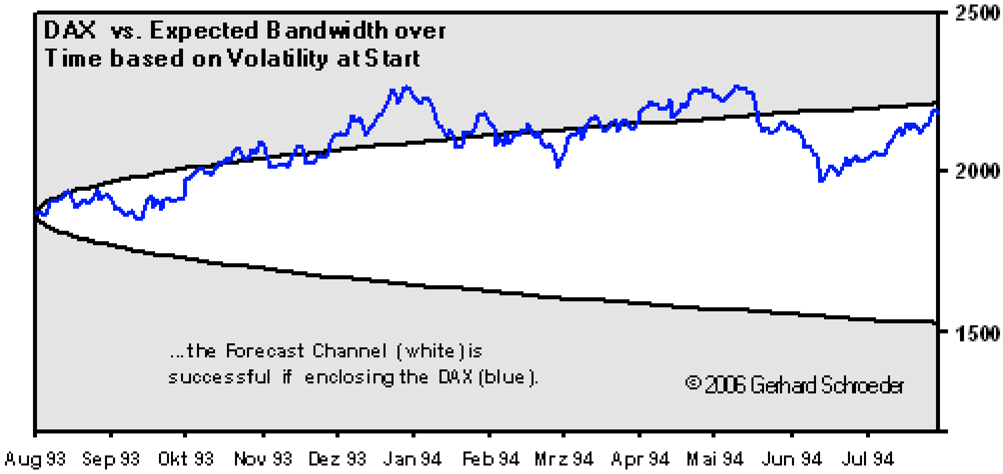
The low level of theoretical returns — e.g. the DJ around 3 percent - does not reflect market reality: the Dow Jones and FTSE indexes over 20 years have, despite lower volatility demonstrated higher returns than the DAX — and all of them around 10 percent or more. Otherwise, in balanced foreign exchange markets currencies should have no returns.

C. VII. Scaling of Volatility

Homoscedastic (somehow constant) volatility allows scaling. Volatility if not specified otherwise is meant for a year that could be 365 calendar days, approximately 252bank days[16], 52 weeks or 12 months. Using bank days one could draw the following lines, the volatility measured ex post between Aug. 1993 and 1994 of about 18 percent was scaled (black) for each day using the number of remaining days in each case. [17]

[16] The precise average figure of a given sample can be determinded by comparing the calendar difference with the number of quotations available.
[17] square root (252/ sample days) * 18,4%

Figure 7: Homoscedasticity



Homoscedasticity is given only if the volatility follows the scaling equation (black lines) strictly - for the first quarter (of this year) the volatility reaches half of the yearly volatility, etc.

C. VIII. Volatility versus Black-Scholes Model

The Black-Scholes model has a different approach: the most probable course is, for whatever reason, assumed intrinsically to be the exercise price. Therefore it is similar to the previous concept except for options strictly "at the money". This is, by the way, the explanation for the "smile" mystery. There is no economic reason to consider the exercise price as the most probable expected future course. The exercise price is arbitrarily set by the emittor. Optimists and pessimists can agree on the same exercise price. They may differ on their individual estimate of the future value of an underlying and the level of risk they want to take and still remain "rational" investors according to the Efficient Market Hypothesis (EMH).

C. IX. Lottery Findings as of 2005

The German lottery drawings since 1955 are well documented. Considering 4340 drawings since October 1955 (including Wednesday lottery since November 1963), the expected value for a particular number should be 4340 * 6 /

49 = 531. In reality however, number 13 was drawn only 471 times whereas 38 was drawn 582 times. Thus even after quite a number of drawings during 50 years there are still deviations, −11 to +10 percent, from the expected. Simulations using mathematical random numbers show similar results. This is statistically in line with degrees of freedom within random systems and there is no reason to question the fairness of the settings.

D. Consequences

All of these appendages are in conflict with the Efficient Market Hypothesis (EMH) that assumes that all relevant information is worked up in a market considered to be "efficient".

The Brownian Motion and financial markets exhibits differ. The course stands for a coordinate of the particle under the microscope, whose stochastic trembling corresponds to constant course motions. But orders are of different size, or equivalently large and also not necessarily independent from each other like molecules of the liquid or their impulses. Orders enter underlying markets without doubt directly into the price computation of the market model. A transacted order is no longer alterable during an auction, even by a "provisional order". Others compare the molecules with the constant information flow, to which the financial markets are exposed. This could apply to derivatives markets, where the emittent can work up to the "quotation". Also, information has a very different effective force, it is usually exogenous and interactive. It would correspond to the closed model of the Brownian Motion where one inclines the microscope or applies heat with a candle under the carrier glass.

Apart from higher temperature, and smaller weight of the particle, viscosity causes increased diffusion. In order to minimize errors by superelevated temperature, auction volumes should not be set too small. Processing speed of orders to be worked on and the quest for real-time processing rank second compared to fair pricing.

Basically it is like reading tea leaves. Empirical, experimental analysis suggests that volatility describes a rather broad prediction channel that contains approximately 50 percent of future courses of a sample of thousands. In the end it should be left to the markets to invest money into individual assessed risks instead of relying on pricing by market makers setting taxed prices based on questionable formulas.

The IASB, the FASB, as well as the SEC don't seem to be fully aware of the model critics or do not consider them in the rules properly. Fair prices related to the Black-Scholes-Merton framework are by no means equivalent to market prices.

Summary

There is no economic reason that future values should depend on today's volatility. It's a belief, a kind of intelligent design of market models. Reported figures should be closer to market decisions. Predictions — pricing of derivatives means predicting — remain uncertain. Using it for evaluations is a field of "creative" accounting. The international accounting rules are no guidance. They are misleading.

Zusammenfassung

Die Kritik an dem Modell von Black und Scholes ist nicht neu. Das Modell war in der Theorie der Finanzmärkte im Begriff, das Attribut "historisch" zubekommen. Neu ist, daß sich das Modell verselbständigt hat und nun unreflektiert in Bilanzierungsstandards und Gesetzens seinen Niederschlag gefunden hat.

Es gibt keine ökonomische Beziehung zwischen dem künftigen Wert einer Notierung und seiner aktuellen Volatilität. Stochastische (Tax-) Preise haben bei Derivaten zu wenig Marktnähe.

Prognosen - das sind Bewertungen von Derivaten - bleiben ungewiß. Nutzt man sie dennoch für Bilanzwerte, ist das ein Feld für kreative Bilanzpolitik.

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Data Sources: Courtesy: Yahoo Finance + Oanda COM (http://www.oanda.com/convert/fxhistory)

References (and evaluations) made by the SEC[18]:

"There are many other options pricing models available. Good books on the topic are Hull, "Options, Futures, and other Derivatives" [now 6th. Ed., 2005] (Prentice Hall), and Natenberg, "Option Volatility and Pricing" (Irwin).

S. Huddart, "Patterns of stock option exercise in the United States," in: J. Carpenter and D. Yermack, Eds. Executive Compensation and Shareholder Value: Theory and Evidence (Kluwer, Boston, MA, 1999), pp. 115-142.38

E. Attachments

E. I. US and EU Accounting Rules (Excerpts)

SECURITIES AND EXCHANGE COMMISSION (SEC) 17 CFR PART 211 [Release no. x] **SAB (Staff Accounting Bulletin) 107, 64 pages**. The interpretations in this staff accounting bulletin express views of the (SEC) staff regarding the interaction between Statement of Financial Accounting Standards Statement No. 123 (revised 2004) reg. valuation methods including assumptions such as expected volatility and expected term, March 29, 2005.

"...a company should select a valuation technique or model that

(a) is applied in a manner consistent with the fair value measurement objective and other requirements of Statement 123R[19],

(b) is based on established principles of financial economic theory and generally applied in that field and

(c) reflects all substantive characteristics of the instrument."

The phrase "the (SEC-) staff ***believes***..." is used very often

The **EC Regulation No 1606/2002** dated July 19, determines that international accounting standard (IAS) are developed by a IAS Committee (IASC), now Board (IASB), prescribed and published then by the European Union as obli-

[18] and not necessarily by the author
[19] This guidance is related to valuations of company's share options.

gatorily rules. SAB 107 seems to be the US pendant to the "Application Guidance" (74 - 82), amendments of IAS 39...*" an integral part of the Standard."*

When comparing IAS 39 with SAB 107 the latter seems to be more specific.

AG82*. An appropriate technique for estimating the fair value of a particular financial instrument would incorporate observable market data about the market conditions and other factors that are likely to affect the instrument's fair value. The fair value of a financial instrument will be based on one or more of the following factors (and perhaps others).*

(a) The time value of money (ie interest at the basic or risk-free rate). Basic interest rates can usually be derived from observable government bond prices and are often quoted in financial publications. These rates typically vary with the expected dates of the projected cash flows along a yield curve of interest rates for different time horizons. For practical reasons, an entity may use an well-accepted and readily observable general rate, such as LIBOR or a swap rate, as the benchmark rate. (Because a rate such as LIBOR is not the risk-free interest rate, the credit risk adjustment appropriate to the particular financial instrument is determined on the basis of its credit risk in relation to the credit risk in this benchmark rate.) In some countries, the central government's bonds may carry a significant credit risk and may not provide a stable benchmark basic interest rate for instruments denominated in that currency. Some entities in these countries may have a better credit standing and a lower borrowing rate than the central government. In such a case, basic interest rates may be more appropriately determined by reference to interest rates for the highest rated corporate bonds issued in the currency of that jurisdiction.

(b) Credit risk. The effect on fair value of credit risk (ie the premium over the basic interest rate for credit risk) may be derived from observable market prices for traded instruments of different credit quality or from observable interest rates charged by lenders for loans of various credit ratings.

(c) Foreign currency exchange prices. Active currency exchange markets exist for most major currencies, and prices are quoted daily in financial publications.

(d) Commodity prices. There are observable market prices for many commodities.

(e) Equity prices. Prices (and indexes of prices) of traded equity instruments are readily observable in some markets. Present value based techniques may be used to ***estimate*** *the current market price of equity instruments for which there are no observable prices.*

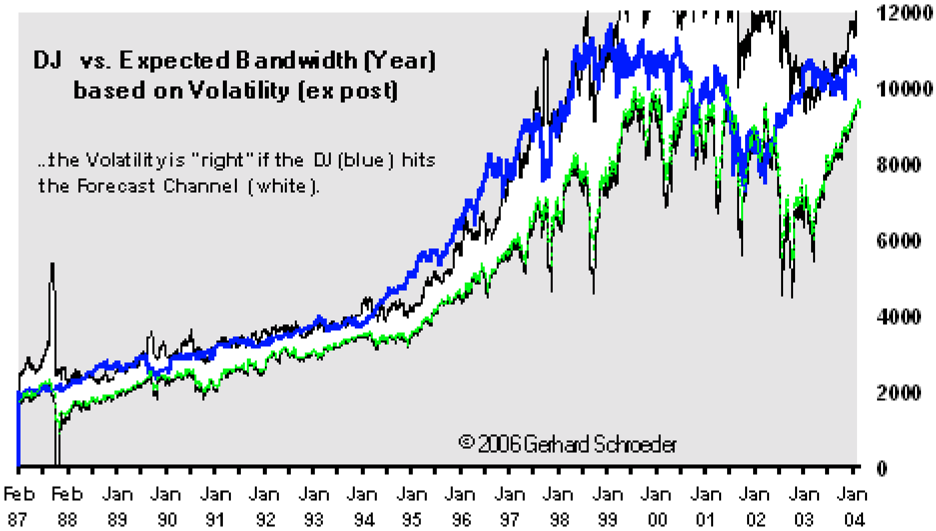
(f) Volatility (ie magnitude of future changes in price of the financial instrument or other item). Measures of the volatility of actively traded items can normally be reasonably estimated on the basis of historical market data or by using volatilities implied in current market prices.

(g) Prepayment risk and surrender risk. Expected prepayment patterns forfinancial assets and expected surrender patterns for financial liabilities can be estimated on the basis of historical data. (The fair value of a financial liability that can be surrendered by the counterparty cannot be less than the present value of the surrender amount...)

E. II. Bandwidth analysis of Dow Jones, FTSE, and Euro/Dollar Rate

Additional analysis furnishing chaper C. II. , Quality of Bandwidth based Prediction. The expected bandwidth of indexes and FTSE as well as the Euro/Dollar exchange rate suggests that the forecast channel be kind of "behind" like the DAX-bandwidth-channel.

Figure 8: Dow Jones



The maverick in 87 shows that forecasts in troubled times do have a sign, plus or minus. The expectations after October 87 were negative. Nobody would have seen a 5000 horizon by then.

Figure 9: FTSE

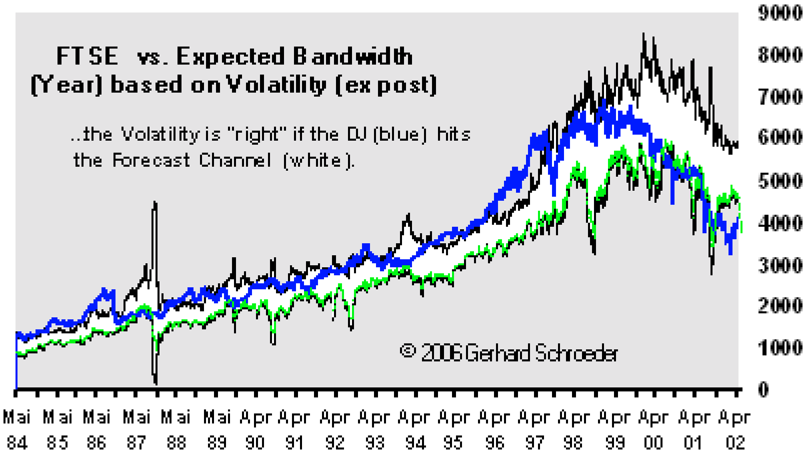
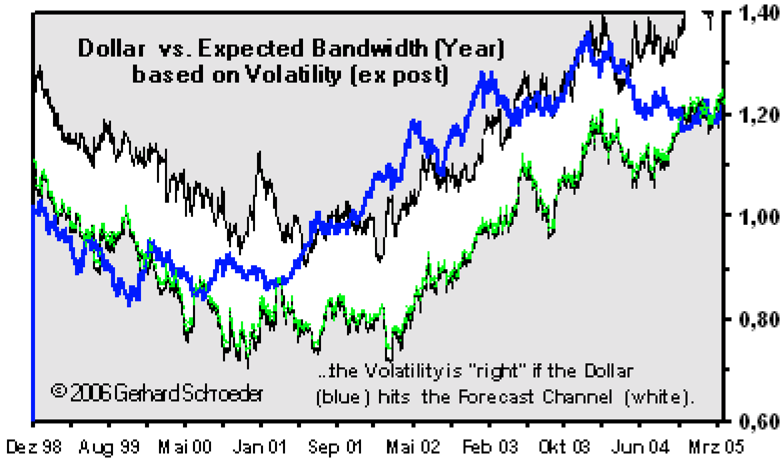


Figure 10: Foreign Exchange (Dollar/Euro)



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Flensburg Nov. 2006 Gerhard Schroeder

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[**] Chris Patten, Baron of Barnes, Chancellor of Oxford University, last Governor of Hong Kong, EU Commissioner: "Not Quite the DIPLOMAT, Home Truths about World Affairs", Allen Lane/Penguin Books © Chris Patten, Nov. 2005, p. 218

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