Physics and banking.

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The statistical physicists observed that the behavior of a macroscopic system, which is composed of a great number of microscopic particles, obeys certain laws which concern mostly random exchange energy phenomena and these laws established the field of Quantum Mechanics and Thermodynamics. Quantum atomic models and kinetic theory of gases prove suitable for studying dynamic structures such as a bank’s balance-sheet.

The bank is considered to be a complex economical system which is segmented by different units, whereas it interacts with the economic environment and thus, it can be studied according to the complex networks methodology. This means that the macroscopic balance sheet’s behavior emerges from the microscopic units interactions. The return which derives from the changes of the bank’s economic value is approached through the ideal gas model. The future business and interest rate scenarios comprise the possible states of the system and the return distribution corresponds to the energy distribution of the gas. The entropy increases until the immunization state where economic value tends to remain stable. However, due to duration drift of products, the economic value changes rapidly and the changes occurring in the structure of the balance sheet are offset with various business strategies in ALM, which correspond to the new structures of internal entropy production in the case of the gas.

The application of Fair Value (FV) according to the IAS offers dynamism to the financial states of the bank which depicts its special characteristics, the market conditions and the customers’ options. The FV may be compared to the dual nature of light as it provides a dual substance of a financial instrument’s value (it includes the return and the undertaking risk in a single number). The FV is produced as the terms return and risk reproduce one another, just like the electromagnetic wave in Maxwell’s theory.

The fair value which is produced by the product’s transition from one time bucket to another defines the possible position and quantizes the risk, just as a similar process occurs with the wave length λ of the emitted radiation due to Bohr’s quantized energy. The electromagnetic spectrum which includes the analysis of radiation may be used for the scaling of each product’s risk, in correspondence with the risk rating that is used by rating agents. The idea of risk quantization could be used for the achievement of balance-sheet immunization against the market’s fluctuations.