1. Some thoughts at the turn of the millennium

About Theory and Practice

On the occasion of the *Workshop on Mathematical Finance* in Strobl and Vienna (September 13–18 , 1999), Alfred Nikolaevich Shiryaev recalled Chebyshev's view on Theory and Practice. We print the introduction of Alfred Nikolaevich's talk:

Not so long before his death, the great mathematician P. L. Chebyshev (1821–1894) stated (half-seriously) his opinion on the relations between *theory* and *practice*.

"Mathematics," he said, "has lived through two eras. In the first, problems werde set by *gods* (the Delian problem of cube duplication) and in the second by *demi-gods* (Pascal, Fermat). We have now entered the third period, when the *necessity* sets problems."

Moreover, Chebyshev was sure that the more difficult was a 'naturally' grown problem arisen in a natural way, the more fruitful would be the methods used for its solution and the more extended the range of their subsequent applications in other areas. Unity of theory and practice was the crucial feature of his mathematical research, and he formulated very vividly the basic principle of this unity in his speech "Drawing geographic maps" delivered 1856 before a big meeting at the St. Petersburg University.

"Mathematical sciences," Chebyshev says, "attract particular attention since distant ages; recently they have become even more important thanks to their influence on the art and the industry. Convergence of the theory and the practice brings about most beneficial results and practice is not the sole beneficiary here: sciences themselves develop further under its influence; it suggests them new subjects for study or reveals novel sides of subjects already well known.

Human activities are extremely varied and, of course, to meet all their demands the science lacks many tools and various mthods. Of a particular significance are methods required for the solution of many versions of one problem that is common for all human practices:

How can one manage one's means to obtain possibly larger gains?

Solution of this kind of problems is the subject of the so-called theory of *minimum* and *maximum* values. These problems are extremely important also for the theory: all the laws governing the motion of matter, weighable or weightless, are solutions of such problems. Their particularly beneficial impact on the development of mathematical sciences is only too evident."

At the end of the speech Chebyshev underlines that a "large portion of practical questions can be stated in the form of problems of maximum and minimum values that is entirely new for the science. Only the solution of these problems can satisfy the requests of practice, which is always in search of *the best and the most efficient*."

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