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Title: The Model Quantitative Firm

Topic: Quantitative Modeling which has applications to topics including

1. Portfolio and risk management
3. Dynamic asset allocation over the life cycle
4. Asset and derivative pricing
7. Asset/Liability Management (ALM)

Keywords: Model, Quantitative Analysis, Computation, Statistics

Abstract: The dream of many quantitatively inclined financial practitioners is to build a complete quantitative model of the financial organization and use this as the basis for managing that organization. It is a dream of clarity, consistency, rationality and efficiency, and yet most practitioners know it is far from realized. Certainly we are much closer to that dream now than we were twenty years ago, with increases in model sophistication for many sources of financial risk and increased computational capability. Models are readily used in pricing, risk management and strategy analysis. Different models are used for different purposes and there are inconsistencies. Practical limitations keep organizations from operating under a single unified model which raises the question of why and whether this should be the case. Models are simplifications, and choosing your simplifications to suit your application is a good starting point but what else is involved and is there a good alternative? Further, wise practitioners are generally wary of decisions based too heavily on models. This comes from hard earned experience to which recent market events have further contributed. This raises the question of what exactly are the technical problems that trip us up. One problem relates to the statistical boundaries of how much information we can extract from limited historical data, particularly when it relates to adaptive market processes. Another challenge relates to computational limits and issues such as the so called "curse of dimensionality" which limits how much analysis we can practically perform. Human limitations also contribute to the problem with issues such as poorly and/or inconsistently described objectives as well as difficulty in collaboratively integrating multiple sources of knowledge. This paper will review these and other underlying technical challenges that must be overcome to more effectively realize the dream of the "model firm", and to discuss areas of research that may yield solutions to the hurdles.