

Preface

This is a selected collection of my academic representative works, which concentrates on the core idea that the scientific metrics decide scientific findings, or the selections of measures determine the discovery of scientific laws. As the choice of different measures may lead to different quantitative relations, the different measures could cause and generate different scientific discoveries.

In the first section of six physical papers, the linked-measure and the linked-field are introduced by using mathematical multi-vector methodology. It is found that a linked-measure can be geometrically represented by a vortex and the linked-field can unify microparticle standard model and macrocosmos standard model, without supersymmetry and with dispelling dark matter and dark energy.

In the following six economic papers, it is revealed that economic measures can be described by complex numbers. It is found that economic equilibrium and economic stability are mastered by Cauchy–Riemann equation and Laplace equation together, while commodity function and money function are unified by complex function.

In the last group of six scientometric papers, a unified informetric model characterized by wave-heat equations is proposed and h -type metrics are developed for the applications in network analysis. Meanwhile, a mathematical theory of knowledge is contributed to approach the unified framework of data-information-knowledge-wisdom.

There are two key ideas which are stressed throughout these chapters. One is that measures link to findings, including physical measures to physical findings, economic measures to economic findings and knowledge measures to knowledge findings. The other is that equations can be the guide for the process, including Hamilton–Lagrange equations for physical process, Cauchy–Riemann equation and Laplace equation for economic process, and wave-heat equations for information process.

These three groups of scientific papers construct a logic chain on nature (physical world)-society (economic world)-knowledge (information world). It is expected to reveal the unified mechanism via scientific metrics in the natural laws

from microparticles to macrocosmos, in the economic rules of human society and in the core knowledge among huge information.

I have been thinking three issues for many years since 1978 when I was 16: (1) what drives the physical world? (2) what masters the economic society? (3) what constructs the human knowledge? The seeking for answers leads to these physical, economic and scientometric papers organized under the title “Scientific Metrics: Towards Analytical and Quantitative Sciences”.

Actually, the collection of selected eighteen papers nearly covers all the creative ideas presented in my representative works, including vortex mechanism applied in physics, complex analysis applied in economics and h -type metrics applied in scientometrics. In these multidisciplinary papers, around natural, social and knowledge mechanisms, I try to clarify three issues: (1) how to measure the physical world? (2) how to measure the economic process? (3) how to measure the human knowledge? In those papers collected in this book, the creative ideas include using linked-measure to physics, complex measure to economics and h -type measure to scientometrics. Also, a philosophical idea is attached in Appendix I.

Concerning the copyright issue of those published papers, I rewrite five scientometric papers by merging two or three articles into one mostly. Except scientometric papers, the copyright of all papers published on and distributed in open-access journals is reserved by myself. The collection integrated them together for a more effective academic communication. I hope that my efforts put into this book could inspire new insights and promote the academic progress.

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