Monographs in Mathematical Economics 2

Toru Maruyama

Fourier Analysis of Economic Phenomena

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Series: Monographs in Mathematical Economics

- **Is the first book to explain how to apply Fourier analysis in business cycle theory in a mathematically rigorous manner**
- **Provides an explanation of Fourier analysis of generalized functions, which is indispensable for business cycle theory**
- **Presents in-depth proofs of Bochner's theorem, a difficult theorem but one with great importance in Fourier analysis**

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This is the first monograph that discusses in detail the interactions between Fourier analysis and dynamic economic theories, in particular, business cycles. Many economic theories have analyzed cyclical behaviors of economic variables. In this book, the focus is on a couple of trials: (1) the Kaldor theory and (2) the Slutsky effect. The Kaldor theory tries to explain business fluctuations in terms of nonlinear, 2nd-order ordinary differential equations (ODEs). In order to explain periodic behaviors of a solution, the Hopf-bifurcation theorem frequently plays a key role. Slutsky's idea is to look at the periodic movement as an overlapping effect of random shocks. The Slutsky process is a weakly stationary process, the periodic (or almost periodic) behavior of which can be analyzed by the Bochner theorem. The goal of this book is to give a comprehensive and rigorous justification of these ideas. Therefore, the aim is first to give a complete theory that supports the Hopf theorem and to prove the existence of periodic solutions of ODEs; and second to explain the mathematical structure of the Bochner theorem and its relation to periodic (or almost periodic) behaviors of weakly stationary processes. Although these two targets are the principal ones, a large number of results from Fourier analysis must be prepared in order to reach these goals. The basic concepts and results from classical as well as generalized Fourier analysis are provided in a systematic way. Prospective readers are assumed to have sufficient knowledge of real, complex analysis. However, necessary economic concepts are explained in the text, making this book accessible even to readers without a background in economics.

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