

Recursive Macroeconomic Theory Mit Press Document

recursive macroeconomic theory mit press has garnered significant attention within the field of economic research, particularly among scholars and students interested in the complex interactions that define macroeconomic dynamics. Publishing cutting-edge work, MIT Press has become a leading source for authoritative texts and innovative theories in recursive macroeconomic modeling. This article explores the core concepts, significance, and recent developments in recursive macroeconomic theory, highlighting why MIT Press's contributions are essential for understanding modern economic systems.

Understanding Recursive Macroeconomic Theory

Recursive macroeconomic theory represents a sophisticated approach to modeling economic phenomena by capturing the dynamic, interdependent decisions made by agents over time. Unlike traditional static models, recursive frameworks allow economists to analyze how current decisions are influenced by expectations of future conditions, creating a structured, backward-looking process that unfolds step-by-step.

Fundamental Principles of Recursive Modeling

Recursive models are built on key principles that make them particularly effective for macroeconomic analysis:

- **Dynamic Programming:** Recursive macroeconomics heavily relies on dynamic programming techniques, where agents optimize their decisions considering future outcomes.
- **Bellman Equations:** Central to recursive models, Bellman equations formalize the optimization process, linking current decisions to future payoffs.
- **Time Consistency:** The approach emphasizes consistent decision-making over time, accounting for how preferences and expectations evolve.
- **Expectations Formation:** Recursive models incorporate how agents form expectations about future variables, influencing current behavior.

Key Components of Recursive Macroeconomic Models

These models typically comprise several interconnected components:

- **State Variables:** Variables that capture the current economic environment, such as capital stock, technology levels, or policy parameters.
- **Decision Variables:** Choices made by agents, including consumption, investment, and labor supply.
- **Transition Functions:** Rules that describe how state variables evolve over time based on decisions and exogenous factors.
- **Optimization Problems:** Formulations where agents maximize utility or profits subject to constraints, solved recursively.

The Role of MIT Press in Advancing Recursive Macroeconomics

MIT Press has been instrumental in disseminating groundbreaking research and comprehensive textbooks that deepen understanding of recursive macroeconomic theories. Their publications serve as foundational resources for both academic research and graduate education.

Notable Publications and Authors

Some of the most influential works published by MIT Press include:

- *Recursive Macroeconomics* by Lars Peter Hansen and Thomas J. Sargent: This seminal book provides an in-depth exploration of the mathematical foundations and applications of recursive models in macroeconomics.
- Works by Christopher A. Sims: Known for his contributions to macroeconomic modeling, Sims's research emphasizes the importance of recursive structures in understanding monetary policy and fiscal dynamics.
- Recent journal compilations and monographs focusing on stochastic dynamic programming, expectations formation, and policy analysis.

Educational Resources and Textbooks

MIT Press offers a variety of textbooks that serve as essential learning tools:

- *Recursive Macroeconomic Theory*: A comprehensive textbook providing a step-by-step guide to the mathematical and conceptual foundations of recursive models.
- Supplementary materials covering computational methods for solving complex recursive systems, including algorithms and software tools.

Applications of Recursive Macroeconomic Theory

Recursive macroeconomic models have broad applications across various domains of economics, offering insights that static models cannot provide.

Monetary Policy and Central Banking

Recursive models help central banks understand how expectations about future policies influence current economic variables such as inflation, output, and employment. They enable policymakers to simulate the effects of different policy rules, forecast economic responses, and design strategies that stabilize the economy.

Fiscal Policy and Government Spending

By modeling how agents anticipate future taxes and government spending, recursive models shed light on the long-term effects of fiscal policy decisions, including debt sustainability and intergenerational equity.

Financial Markets and Asset Pricing

Recursive frameworks are essential in modeling investor expectations, asset bubbles, and market dynamics, capturing how agents update their beliefs based on new information and future outlooks.

Recent Developments and Future Directions

The field of recursive macroeconomic theory continues to evolve, integrating new computational techniques, behavioral insights, and empirical data.

Computational Advancements

Modern recursive models leverage advanced algorithms and high-performance computing to solve models with high-dimensional state spaces, enabling more realistic and detailed simulations.

Behavioral and Heterogeneous Agent Extensions

Emerging research incorporates behavioral biases, heterogeneity among agents, and bounded rationality, enriching the descriptive power of recursive models.

Policy Evaluation in Uncertain Environments

With increasing economic volatility, recursive models are being adapted to evaluate policies under uncertainty, including shocks from globalization, technological change, and climate risks.

Why Choose MIT Press for Recursive Macroeconomic Theory Resources?

Selecting authoritative publications from MIT Press ensures access to rigorous, peer-reviewed research that pushes the boundaries of macroeconomic understanding.

- **Credibility:** MIT Press's reputation for academic excellence guarantees high-quality content.
- **Comprehensive Coverage:** Their books encompass theoretical foundations, computational methods, and practical applications.
- **Up-to-Date Research:** Publications feature the latest advancements, facilitating cutting-edge learning and research.

Conclusion

Recursive macroeconomic theory, as presented and supported by MIT Press publications, stands at the forefront of modern economic analysis. Its emphasis on dynamic decision-making, expectations, and intertemporal optimization provides a nuanced understanding of macroeconomic phenomena. Whether you are a student, researcher, or policymaker, engaging with recursive models through MIT Press's authoritative resources will enhance your comprehension of complex economic systems. As the field continues to advance, these models will undoubtedly play a pivotal role in shaping effective policies and innovative research in macroeconomics.

Recursive Macroeconomic Theory MIT Press: A Deep Dive into the Foundations and Implications

In the ever-evolving landscape of macroeconomic research, the recursive macroeconomic theory MIT Press has emerged as a cornerstone for understanding complex economic dynamics through the lens of recursive methods. This body of work, often associated with pioneering texts and research publications published by the MIT Press, offers a rigorous, mathematically grounded approach to analyzing how economies evolve over time, especially when agents' expectations and decision-making processes are modeled recursively. Whether you are an academic, a graduate student, or an economic policymaker, understanding the core principles and applications of recursive macroeconomic theory is essential for grasping contemporary macroeconomic modeling.

What is Recursive Macroeconomic Theory?

At its core, recursive macroeconomic theory involves representing the decision-making processes and dynamic evolution of an economy using recursive functions and systems. Unlike traditional equilibrium models that often rely on static or equilibrium conditions, recursive models emphasize the ongoing, step-by-step decision processes of economic agents under uncertainty and their implications for macroeconomic variables such as output, consumption, investment, and inflation.

Key features include:

- Dynamic programming: Agents optimize their decisions over time, taking future consequences into account.
- Bellman equations: Central tools that characterize the value functions of agents, capturing the trade-offs faced in each period.
- Recursive functions: These functions describe how current decisions depend on the state variables and expectations about the future.

The recursive macroeconomic theory MIT Press literature broadly encompasses models that leverage these features to analyze macroeconomic phenomena like business cycles, monetary policy, fiscal policy, and growth.

Historical Context and Foundational Texts

The development of recursive macroeconomic theory was significantly influenced by advances in dynamic programming and control theory, with key milestones including:

- The Dixit-Stiglitz models introducing recursive preferences.
- The Kydland and Prescott real business cycle models emphasizing time-series behavior.
- The formalization of Rational Expectations Equilibrium frameworks.

The MIT Press has been instrumental in publishing seminal works that formalize these models and extend their applications. Notable titles include:

- "Recursive Methods in Economic Dynamics" ? a comprehensive guide detailing the mathematical techniques.
- "Dynamic Programming and Optimal Control" ? foundational for understanding the recursive methods underpinning macro models.
- "Macroeconomic Dynamics" ? integrating recursive methods into macroeconomic theory and policy analysis.

Core Components of Recursive Macroeconomic Models

Understanding the structure of recursive macroeconomic models requires familiarity with several key components:

- State Variables

These are the variables that summarize the current state of the economy, such as capital stock, productivity levels, or inflation rates.

- Control Variables

Decisions made by agents?like consumption, investment, or labor supply?that influence the economy's evolution.

- Value Functions

Functions representing the maximum attainable utility or profit given the current state, derived via dynamic programming.

- Bellman Equations

Recursive equations that relate the value of current decisions to future payoffs, enabling the solution of the model.

- Expectations

Agents form expectations about future states and variables, often modeled as rational expectations, embedding forward-looking behavior into the model.

Modeling Approach and Mathematical Framework

Recursive macroeconomic models typically follow a structured approach:

- Specify the Economic Environment

- Define preferences, technologies, and constraints.

- Formulate the problem in terms of maximizing utility or profits over time.

- Derive the Bellman Equation
- Write the recursive relation linking current value functions to future value functions.
- For example, the Bellman equation for a consumer might be:

$$V(k) = \max_{\{c\}} \{ u(c) + \beta V(k') \}$$

where $u(c)$ is utility from consumption c , β is the discount factor, and k' is the next period's capital.

- Solve the Recursive System
- Use mathematical tools like value function iteration, policy function iteration, or perturbation methods.
- Analyze Policy Functions and Equilibrium
- Derive decision rules (policy functions) that specify optimal actions given the current state.
- Simulate or Calibrate the Model
- Use data to simulate the model's implications or calibrate parameters for empirical analysis.

Applications of Recursive Macroeconomic Theory

The versatility of recursive models makes them applicable across a range of macroeconomic topics:

- Business Cycle Analysis: Understanding fluctuations via models where agents optimize under uncertainty, incorporating expectations about future productivity or shocks.
- Monetary and Fiscal Policy: Analyzing how central banks and governments can influence macro variables through policy rules embedded in recursive frameworks.
- Asset Pricing and Investment: Modeling how agents value assets over time considering recursive expectations.
- Economic Growth: Exploring long-term growth paths with recursive decision-making, including

models of research and development or technological change.

- Consumption-Savings Decisions: Capturing intertemporal choices with recursive preferences, such as Epstein-Zin utility.

Advantages of Recursive Modeling in Macroeconomics

Recursive macroeconomic models offer several distinct advantages:

- Clarity and Structure: They break down complex dynamic problems into manageable, recursive components.
- Flexibility: Capable of incorporating various features like stochastic shocks, heterogeneous agents, and learning.
- Computational Tractability: Recursive algorithms are well-suited for numerical solution methods, making complex models solvable with modern computational tools.
- Policy Analysis: Enable detailed evaluation of policy interventions over time, accounting for forward-looking expectations.

Challenges and Limitations

Despite their strengths, recursive macroeconomic models face certain limitations:

- Model Specification: Requires precise assumptions about preferences, technology, and expectations.
- Computational Complexity: High-dimensional models can become computationally intensive.
- Expectations Formation: Modeling how agents form expectations (rational or adaptive) remains a challenge.
- Empirical Validation: Ensuring models accurately reflect real-world data can be difficult, especially with simplifying assumptions.

Future Directions and Ongoing Research

The field continues to evolve, with recent research focusing on:

- Heterogeneous Agents: Incorporating income and wealth inequality into recursive frameworks.
- Learning and Expectations: Moving beyond rational expectations to models where agents learn over time.
- Environmental and Climate Economics: Applying recursive models to long-term sustainability and resource management.

- Artificial Intelligence and Machine Learning: Leveraging new computational techniques to solve high-dimensional recursive models.

Final Thoughts

The recursive macroeconomic theory MIT Press represents a vital development in understanding the dynamic and often unpredictable nature of economies. By formalizing decision-making processes through recursive functions and dynamic programming, economists can better analyze policy impacts, business cycles, and growth trajectories. As computational power and theoretical methods continue to advance, recursive models will undoubtedly play an increasingly central role in macroeconomic research and policymaking.

Whether you are delving into academic research or applying macroeconomic insights in policy design, mastering the principles of recursive macroeconomic theory offers a powerful toolkit for navigating the complexities of modern economies.

Question What is the main focus of 'Recursive Macroeconomic Theory' published by MIT Press? The book explores the foundational principles and advanced methods of modeling macroeconomic phenomena using recursive techniques, emphasizing dynamic optimization and equilibrium analysis. How does 'Recursive Macroeconomic Theory' contribute to current economic research? It provides a rigorous framework for understanding dynamic decision-making in macroeconomics, aiding researchers in developing more accurate models of economic growth, policy analysis, and financial markets. Who are the primary authors or contributors of 'Recursive Macroeconomic Theory'? The book features contributions from leading economists and researchers specializing in macroeconomic theory, dynamic programming, and recursive methods, often including notable scholars affiliated with MIT. What prerequisites are recommended for readers of 'Recursive Macroeconomic Theory'? Readers should have a solid background in advanced microeconomics, dynamic programming, mathematical methods, and basic macroeconomic concepts to fully grasp the material. In what ways does 'Recursive Macroeconomic Theory' differ from traditional macroeconomic textbooks? It emphasizes recursive methods and dynamic programming techniques, providing a more rigorous and mathematically detailed approach compared to conventional macroeconomic texts that often focus on aggregate models without recursive structures. Is 'Recursive Macroeconomic Theory' suitable for graduate students and researchers? Yes, it is particularly designed for graduate students, researchers, and professionals seeking an in-depth, technical understanding of modern recursive methods in macroeconomics. Are there any online resources or supplementary materials associated with 'Recursive Macroeconomic Theory'? Yes, MIT Press often provides supplementary materials, such as lecture notes, datasets, and online tutorials, to complement the book's content, accessible through their official website or academic platforms. What are some key topics covered in 'Recursive Macroeconomic Theory'? Key topics include dynamic programming, stochastic processes, equilibrium analysis, consumption and investment decisions over time, and the application of recursive methods to macroeconomic policy

models.

Related keywords: recursive macroeconomics, MIT Press books, macroeconomic modeling, economic theory, recursive methods, macroeconomic research, economic dynamics, computational macroeconomics, advanced macro theory, economic modeling techniques

an introduction to ergodic theory graduate texts i

An introduction to ergodic theory graduate texts i serves as a foundational guide for graduate students venturing into this fascinating branch of mathematics. Ergodic theory, at its core, explores the long-term average behavior of dynamical systems and their statistical properties. It has profound applications across mathematics, physics, and even in fields like economics and computer science. For students beginning their journey, selecting the right graduate texts is crucial for building a solid understanding, developing intuition, and engaging with current research directions. This article aims to provide a comprehensive overview of essential ergodic theory texts, their key features, and how they can serve as effective learning tools.

Understanding the Foundations of Ergodic Theory

Before diving into specific texts, it's important to understand what ergodic theory encompasses and why it's a vital area of study. This section offers a brief overview of the fundamental concepts and the scope of graduate-level texts.

What is Ergodic Theory?

Ergodic theory studies the behavior of measure-preserving transformations on probability spaces. Essentially, it addresses questions like: How do points in a dynamical system distribute over time? Do the time averages of functions along trajectories converge to space averages? These questions are rooted in the ergodic hypothesis, which originated from statistical mechanics.

Key concepts include:

- Measure-preserving transformations
- Ergodicity and mixing
- Invariant measures
- Birkhoff's Ergodic Theorem
- Unique ergodicity

Understanding these ideas lays the groundwork for exploring more advanced topics covered in graduate texts.

Essential Graduate Texts in Ergodic Theory

Choosing the right textbooks is essential for mastering ergodic theory. The following sections highlight some of the most influential and widely recommended graduate-level texts, discussing their strengths and targeted audiences.

1. "An Introduction to Ergodic Theory" by Peter Walters

Walters' book is often considered a classic starting point for graduate students.

Key features:

- Clear and rigorous presentation
- Focuses on measure-theoretic foundations
- Covers fundamental theorems such as Birkhoff's and von Neumann's
- Includes numerous exercises for practice

This text is ideal for students new to the field, providing a solid theoretical foundation before moving to more specialized topics.

2. "Ergodic Theory" by Karl Petersen

Petersen's work is comprehensive and slightly more advanced.

Key features:

- Emphasizes both measure-theoretic and topological dynamics
- Discusses entropy, mixing, and applications
- Contains detailed proofs and examples
- Suitable for students with some background in measure theory and topology

This book bridges foundational concepts with more recent developments, making it a good next step after Walters.

3. "Introduction to Ergodic Theory" by Ya. G. Sinai

Sinai's text offers a blend of intuition and formalism.

Key features:

- Focuses on the intuition behind the theorems
- Connects ergodic theory with statistical mechanics
- Includes historical notes and motivations
- Suitable for students who prefer a conceptual approach

Additional Resources and Advanced Texts

Graduate students aiming to deepen their understanding should explore more specialized and advanced texts. Here are some noteworthy options:

1. "Ergodic Theory and Differentiable Dynamics" by Anatole Katok and Boris Hasselblatt

This comprehensive volume covers a broad spectrum of topics.

Highlights:

- Smooth ergodic theory
- Hyperbolic systems and Anosov diffeomorphisms
- Structural stability
- It is suitable for students interested in the interface between ergodic theory and differential dynamics.

2. "Measure Theory and Probability" by Malcolm Adams and Victor Guillemin

While broader in scope, this book provides valuable measure-theoretic background essential for advanced ergodic theory.

Strategies for Studying Ergodic Theory Graduate Texts

Mastering ergodic theory requires more than just reading; active engagement is key. Here are some tips for making the most of these texts:

- **Start with the basics:** Ensure a solid understanding of measure theory, topology, and

functional analysis.

- **Work through exercises:** Practice problems reinforce concepts and develop problem-solving skills.
- **Supplement with lectures and seminars:** Engage with online courses or university seminars for different perspectives.
- **Form study groups:** Discussing complex topics with peers enhances understanding.
- **Connect theory to applications:** Explore how ergodic theory applies to physics, information theory, and other fields.

Conclusion

An introduction to ergodic theory graduate texts provides a roadmap for students embarking on this mathematical journey. Starting with foundational books like Walters' "An Introduction to Ergodic Theory" offers an accessible entry point, while advanced texts like Katok and Hasselblatt's work open doors to current research areas. By selecting appropriate resources, actively engaging with the material, and connecting theory with applications, students can develop a deep and lasting understanding of ergodic theory. Whether your interest lies in pure mathematics, statistical mechanics, or dynamical systems, the right graduate texts are invaluable tools for your academic and research pursuits in ergodic theory.

An Introduction to Ergodic Theory Graduate Texts: A Comprehensive Guide for Students and Enthusiasts

Embarking on the study of ergodic theory graduate texts opens a gateway to a rich and profound branch of mathematics that intersects dynamical systems, measure theory, probability, and statistical mechanics. For graduate students venturing into this field, selecting the right textbooks can significantly influence their understanding and appreciation of the subject. This guide aims to shed light on the foundational texts, their structure, strengths, and how they serve as stepping stones into the depths of ergodic theory.

Understanding the Foundations of Ergodic Theory

Before diving into specific texts, it's crucial to grasp what ergodic theory entails. At its core, ergodic theory studies the long-term average behavior of dynamical systems with an invariant measure. Its applications range from statistical physics and information theory to number theory and chaos theory.

Key concepts include:

- Measure-preserving transformations

- Invariant measures
- Ergodicity and mixing
- Birkhoff's Ergodic Theorem
- Ornstein's theory of Bernoulli flows

Graduate texts in ergodic theory typically assume familiarity with measure theory, topology, and basic dynamical systems, making it a challenging yet rewarding subject for advanced students.

The Landscape of Graduate Texts in Ergodic Theory

Choosing a graduate-level textbook involves understanding its approach, prerequisites, and depth. The major texts in the field can generally be categorized based on their focus: foundational theory, applications, or a blend of both.

Classic and Seminal Texts

- "Ergodic Theory" by Peter Walters

- Overview: Widely regarded as a definitive introductory textbook, Walters' "Ergodic Theory" is praised for clarity, rigorous proofs, and comprehensive coverage.
- Scope: It covers measure-preserving transformations, ergodic decomposition, mixing properties, and entropy.
- Strengths:
 - Well-structured for graduate courses
 - Emphasizes the connection between measure theory and dynamics
 - Includes numerous examples and exercises
- Prerequisites: Measure theory, basic topology, and some familiarity with dynamical systems.

- "An Introduction to Ergodic Theory" by Peter Walters

- Often considered the go-to text for graduate students or advanced undergraduates beginning the subject.
- Focuses on core concepts with detailed proofs.
- Suitable as a primary textbook or supplementary resource.

Advanced and Specialized Texts

- "Ergodic Theory via Joinings" by Eli Glasner

- Overview: Focuses on joinings, a sophisticated tool in ergodic theory, providing a modern perspective.
- Audience: More suitable for students who have already mastered the basics and want to explore advanced topics.
- Features: Incorporates recent developments, emphasizing the structural and classification aspects of ergodic systems.

- "Entropy, Large Deviations, and Statistical Mechanics" by David Ruelle

- While broader in scope, this text delves into the thermodynamic formalism, a key area in ergodic theory.
- Ideal for students interested in the applications of ergodic theory in statistical physics.

Textbooks with a Focus on Applications or Interdisciplinary Approaches

- "Ergodic Theory: with a view towards Number Theory" by Manfred Einsiedler and Thomas Ward

- Overview: Connects ergodic theory with number theory, providing applications to problems like equidistribution and primes.
- Features: Combines rigorous theory with motivating applications, making it accessible and engaging.

How to Choose the Right Graduate Text in Ergodic Theory

When selecting a textbook, consider the following factors:

- Prerequisites: Ensure you have a solid background in measure theory and topology.
- Focus Area: Decide whether you want a foundational understanding or a focus on particular applications.
- Depth: Some texts offer a broad overview, while others delve into specialized topics.
- Teaching Style: Supplementary materials, exercises, and clarity of exposition can greatly impact your learning.

Recommended approach:

- Start with Walters? "Ergodic Theory" for a comprehensive foundation.
- Use other texts, like Glasner?s "Ergodic Theory via Joinings," for advanced topics.
- Supplement with research papers and lecture notes for recent developments.

Structuring Your Study of Ergodic Theory

To maximize your understanding, consider a structured approach:

- Build a Strong Measure Theory Foundation
 - Review measure spaces, sigma-algebras, and integration.
 - Study probability theory basics, as ergodic theory often involves probabilistic concepts.
- Understand Dynamical Systems
 - Familiarize yourself with topological and measurable dynamics.
 - Explore examples like rotations, shifts, and hyperbolic systems.
- Dive into Core Ergodic Concepts
 - Invariant measures and ergodicity
 - Birkhoff?s Ergodic Theorem
 - Mixing properties and their implications
- Explore Advanced Topics
 - Entropy theory
 - Ornstein?s isomorphism theorem
 - Joinings and structural classification
 - Connections with number theory and statistical mechanics

Supplementary Resources and Learning Strategies

- Lecture series: Many universities offer free lecture notes; for example, the lecture series by Peter Walters or others available online.
- Problem sets: Practice through exercises in textbooks or problem books.
- Research papers: Engage with current developments by reading papers in journals like Ergodic Theory and Dynamical Systems.
- Discussion groups: Join seminars or study groups focused on ergodic theory.

Conclusion

An introduction to ergodic theory graduate texts is essential for anyone aiming to master the subject at an advanced level. The journey begins with foundational texts like Peter Walters' "Ergodic Theory," which offers clarity and depth, and then progresses into more specialized or application-driven materials. By understanding the structure, prerequisites, and scope of these texts, students can tailor their learning path effectively. With dedication, rigorous study, and engagement with supplementary materials, mastering ergodic theory becomes an achievable and intellectually rewarding pursuit.

Final Tips

- Be patient: The subject is challenging but immensely rewarding.
- Connect theory with examples: Visualize systems like rotations or shifts.
- Engage actively: Solve problems and participate in discussions.
- Keep abreast of current research: This enriches your understanding and opens new avenues.

Embark on this mathematical voyage with confidence?ergodic theory offers profound insights into the behavior of complex systems and the nature of randomness and order in mathematics.

Question What is the primary focus of 'An Introduction to Ergodic Theory' by Peter Walters? The book provides a rigorous introduction to ergodic theory, focusing on measure-preserving transformations, ergodic theorems, and their applications in dynamical systems and statistical mechanics. Which prerequisites are recommended before studying this text? A solid background in measure theory, real analysis, and basic topology is recommended to fully grasp the concepts presented in the book. How does the book approach the topic of ergodic theorems? It systematically introduces the mean and pointwise ergodic theorems, providing proofs and discussing their implications in the context of dynamical systems. Are there applications of ergodic theory discussed in this graduate text? Yes, the book explores applications such as statistical properties of dynamical systems, mixing, and entropy, illustrating how ergodic theory connects to

various fields. Is this book suitable for self-study or primarily for classroom use? While designed as a graduate textbook, it is also suitable for self-study due to its clear explanations, though some background in measure theory is helpful. What makes 'An Introduction to Ergodic Theory' by Walters a trending choice among graduate texts? Its comprehensive coverage, clear exposition, and balance between theory and applications have made it a popular and influential resource in the field of ergodic theory.

Related keywords: ergodic theory, measure theory, dynamical systems, invariant measures, ergodicity, mixing, entropy, Birkhoff's theorem, stationary processes, ergodic decomposition

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