

Implementing Recycled Material Derivatives to Transform the Marketplace: Moving from Concept to Reality

White Paper
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Figure 1: "Group of volunteers with youth organization charity help cleanup recycle plastic bottles into recycle bin in local public park in residential neighborhood together stock photo" CC FangXiaNuo

Summary of earlier work

In our previous study,¹ we addressed the inefficiencies in recycling, particularly in the United States, where a significant portion of recyclable materials ends up in landfills despite the demand from large buyers. We proposed a solution involving the creation of derivatives, specifically futures contracts, for post-consumer materials (PCMs) to establish a marketplace for their exchange. The goal would be to overcome the challenges related to variability in quantity and quality within the PCM supply chain.

The proposed derivatives would standardize volume, quality, and contamination levels, providing consistency in material streams. This standardization, facilitated by futures contracts, could lead to increased transparency, reduced price volatility, and improved transaction efficiency. We argued that such a system would incentivize better compliance with industry standards and, over time, come to exclude non-compliant participants. The paper emphasized the benefits of using exchange-traded derivatives instead of over-the-counter trading, citing increased transparency and reduced counterparty credit risk.

We suggested that an active PCM derivatives market would not only address the challenges of price volatility and quality but also help identify truly recyclable materials based on market demand. The proposal envisioned futures contracts for PCM being traded on established exchanges such as those operated by the CME Group or ICE. We acknowledged a number of regulatory challenges as well, particularly the need for approval from the Commodity Futures Trading Commission (CFTC).

The paper concluded by highlighting the potential for a PCM derivatives exchange, located in New Jersey, to unite multiple states and regions, creating broader markets with deeper liquidity. We anticipated that understanding and implementing PCM derivatives could position New Jersey as a significant supplier of recycled materials nationally and even internationally. Overall, the proposal aimed to encourage experimentation within the recycling industry and attract new participants by supporting the establishment and proper functioning of a PCM derivatives market.

In our scientific paper, we also published the results of our study employing a combination of theoretical analysis and case analysis to delve into the origins of derivatives, the principles of trading, and the explicit and potential risks associated with these financial instruments. We drew parallels between the impact of futures contracts on underlying asset market quality and the potential for futures contracts to enhance the efficiency and stability of the recycling industry. The proposed PCM futures contracts are suggested to play a similar role to weather derivatives in allowing the ultimate buyers and sellers of recycled material to reduce various types of risk exposure. The study emphasized the importance of financial instruments, such as futures contracts, in providing a mechanism for risk reduction for buyers and sellers of

¹ Howell, Moore, Folkinshteyn (2022). "The Potential for Exchange-Traded Futures on Recycled Materials to Improve Recycling Efficiency" *Investment Management and Financial Innovations*, 19(3), 93-104. See also our earlier white paper, "Enhancing Markets for Post-Consumer Materials through Derivatives: Connecting New Jersey Recycling Programs to the Broader Market", available at: <http://pcm-derivatives.info/whitepaper.html>

recycled materials alike, thereby contributing to the overall efficiency and efficacy of markets for recycled materials.

Current Study:

Our more recent research continues to investigate the feasibility of a futures market for recycled materials. Clearly, there is increasing consumer pressure on firms to enhance sustainability, leading to a surge in commitments to incorporate PCM into products. State-level mandates and extended producer responsibility laws further contribute to a growing demand for PCM. However, the PCM market continues to face challenges including inefficient collection systems resulting in wasted supply and difficulties for large buyers in securing adequate PCM supplies. Building on our previous research demonstrating high PCM price volatility and outlining the ideal structure for widely traded PCM futures contracts, we conducted a new study to better understand the practical factors facing such a market.

To understand the factors influencing market participants' willingness to trade PCM using derivatives and a centralized exchange, we reviewed relevant literature from social sciences and finance disciplines to examine the factors shaping adoption of financial innovations. We applied the Technology Acceptance Model to analyze potential factors influencing the adoption of exchange-traded PCM derivatives, focusing on perceived usefulness, ease of use, and trust. We also drew insights from the vast literature stock market participation, exploring factors such as financial literacy, social capital, trust, demographic characteristics, and previous investing experience.

We also conducted a number of stakeholder interviews, aiming to identify potential barriers to participation in the new PCM derivatives marketplace and understand stakeholders' preferences regarding market and contract design. The interviews, conducted with anonymity assurance, involved participants derivatives and commodities, waste and recycling, state-level environmental regulation, and research and media sectors. Our interview data was contextualized with questions about participants' familiarity with derivatives, understanding of commodities markets, and attitudes toward financial innovation.

What did we learn?

The major themes identified from participant interviews are summarized as follows:

1. Business Case for Participation: All interview participants (100%) recognized a business case for participating in a PCM derivatives market, citing price volatility as a key motivator. Large firms operating on both the buy-side and sell-side might, however, be cautious due to potential issues with prices negotiated through a centralized exchange. About 70% of participants from the recycling industry agreed that a derivatives exchange with standardized contracts could benefit in terms of managing contamination rates in PCM, a significant challenge in the recycling industry.

2. Commodity Type and Potential Success: Participants unanimously (100%) emphasized the critical importance of the underlying commodity in the success of a PCM derivatives exchange. While there was skepticism about the viability of futures contracts for certain materials like pulp and paper, optimism was expressed for major grades of recycled plastics. Standardized contracts could ensure the supply of specific plastic grades, making recycling collection and processing efforts more valuable.

3. Mode of Settlement: Cash vs. Physical: Settlement mode emerged as a vital consideration, with 39% of participants highlighting its importance. The study discussed the pros and cons of cash settlement versus physical settlement, emphasizing the need for a credible index for cash settlement and outlining the logistical challenges of physical settlement. Settlement mode was seen as critical in encouraging or discouraging participation from market-making entities.

4. Role of State and Federal Policy: About 39% of participants noted the potential influence of state and federal recycling policies on the PCM derivatives exchange. Mandatory recycled content laws and Extended Producer Responsibility (EPR) laws were identified as significant factors that could disrupt supply and demand dynamics. An uneven implementation of these laws at the state level could lead to market imbalances.

What's Next?

The study concludes that while there is a clear business case for a PCM derivatives exchange, several factors need careful consideration, including commodity type, settlement mode, and the impact of recycling policies. The mode of settlement is identified as a priority for further research. The study suggests that an active market for PCM derivatives could lead to positive outcomes, such as reducing price volatility, improving quality standards, and increasing transparency in transactions. The report also emphasizes the need for attention to market design and mechanics in addition to technical challenges in recycling. Future research is necessary to explore avenues for both cash and physical settlement, identify acceptable indices for cash-settled contracts, determine the infrastructure and logistical requirements for physically-settled contracts, and address other considerations for listing derivatives on an exchange.



Figure 2: "Group of volunteers with youth organization charity help cleanup recycle plastic bottles into recycle bin in local public park in residential neighborhood together stock photo" CC FangXiaNuo

You can learn more about our project, and view recordings of our stakeholder panels, on our project website: <http://pcm-derivatives.info>