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# Using an artificial financial market for assessing the impact of Tobin-like transaction taxes

Katiuscia Mannaro, Michele Marchesi *, Alessio Setzu

*DIEE, University of Cagliari, Italy*

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**Abstract**

The Tobin tax is a solution proposed by many economists for limiting the speculation in foreign exchange and stock markets and for making these markets stabler. In this paper we present a study on the effects of a transaction tax on one and on two related markets, using an artificial financial market based on heterogeneous agents.

The microstructure of the market is composed of four kinds of traders: random traders, fundamentalists, momentum traders and contrarians, and the resources allocated to them are limited. In each market it is possible to levy a transaction tax. In the case of two markets, each trader can choose in which market to trade, and an attraction function is defined that drives their choice based on perceived profitability. We performed extensive simulations and found that the tax actually increases volatility and decreases trading volumes. These findings are discussed in the paper.


*JEL classification:* D53; G18

## 1. Introduction

The deep financial crises over the past decade, starting with the Mexican pesos crisis in 1994 to the one in Argentina in 2001, raised serious doubts as to the ability of free markets to reflect the "true" value of a specific currency. In fact, too many speculative activities can produce a strong bias in exchange rates and create a monetary crisis, or at least amplify its effects. Many observers claim that a tax on currency transactions may prove a powerful tool for penalizing speculators and stabilizing markets. For these reasons, in recent years there has been an ongoing interest in the idea advanced by some economists (the most famous being James Tobin; see Tobin, 1978) to levy a small tax on currency transactions.

Over the last 30 years the volume of foreign exchange trading has increased hugely. In 1973, daily trading volume averaged around $15 billion; today, it averages $1.9 trillion (Galati et al., 2005). Moreover, 90 percent of the trading volume concerns short-term transactions. In general, economists believe that most short-term transactions are of a speculative nature, and many considered them to be a source of market volatility and instability. Instead, medium or long-term transactions are usually related to real investments.

* Corresponding author at: University of Cagliari, Department of Electric and Electronic Engineering, Piazza d'Armi, 09123 Cagliari, Italy. Tel.: +39 070 675 5757; fax: +39 070 675 5782.
*E-mail address:* michele@diee.unica.it (M. Marchesi).

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In 1936, Keynes in *The General Theory of Employment, Interest and Money* asserted that the levy of a small tax on all stock exchange transactions should contribute to reducing instability in domestic stock markets. According to Keynes, this tax should discourage speculators from trading, resulting in lower price volatility of the taxed asset.

In 1978, the Nobel Prize Laureate in Economics James Tobin proposed the levy of a small tax (0.1 percent) on all foreign exchange transactions. This would penalize short-term speculators but not long-term investors, favoring market stability. Later, several authors (see, e.g., Palley, 1999; Baker, 2000; Felix and Sau, 1996; Jeffrey, 1996; Kupiec, 1995) proposed a similar solution for other kinds of securities.

On the other hand, some economists disagree with Keynes and Tobin's views. Friedman (1953) challenged these theories, arguing that speculative trading could stabilize prices.

Only a few empirical analyses have studied the effects of transaction taxes on price volatility. Umlauf (1993) studied Swedish stock market data and showed that the introduction of a Swedish tax increased the volatility of stock prices. It is worth noting that the tax level was set at 1 percent in 1984 and at 2 percent in 1986: such values are far too high compared with the percentage proposed by Tobin.

Habermeier and Kirilenko (2003) analyzed the effects of transaction costs and of capital controls on markets and showed that they can have negative effects on price discovery, volatility and liquidity, reducing market efficiency. They produced evidence that the Tobin tax increases market volatility by discouraging transacting, thereby reducing market liquidity.

Palley (2003) argues that the Tobin tax is good for financial stability, and that total transaction costs are not necessarily increased by its imposition. Actually, transaction costs could change the composition of traders, precluding short-term investors from the market. It leads to a reduction in volatility and consequently in total transaction costs.

Aliber et al. (2003) demonstrated that a Tobin tax on Foreign Exchange Transactions may increase volatility. They constructed the time series of monthly transaction costs estimates, volatility and volume for four currencies (the British Pound, the Deutsche Mark, the Japanese Yen and the Swiss Franc) for the period of 1977–1999, and showed that volatility is positively correlated with the level of transaction costs, while trading volume is negatively correlated. Their results suggest that an increase in transaction costs leads to a decrease in trading volume. Therefore, the effect of the tax on volatility is exactly the opposite of what the proponents of the Tobin tax would like to have seen. On the other hand, their findings were strongly criticized by Werner (2003), who argued that the direction of causality between tax and volatility/volumes may be just the opposite.

In *The effectiveness of Keynes–Tobin transaction taxes when heterogeneous agents can trade in different markets: a behavioral finance approach*, Westerhoff and Dieci (2006) developed a model in which rational agents apply technical and fundamental analyses for trading in two different markets. Their model shows that if a transaction tax is imposed on one market, speculators leave this market, making it less volatile. Therefore, their model confirms Tobin's hypothesis.

Thus, the debate on whether levying a small tax on each market transaction could help to reduce speculation and price volatility is still open. The reactions of stock markets to the imposition of margin requirements and of short-selling restrictions are still not fully understood, and rules and regulations could be implemented without a clear understanding of their potential impact. It is difficult to test the effects of restrictions on real markets empirically, and the simulation approach could help us to understand these phenomena in a non-invasive way.

In this paper, we contribute to this debate by proposing a multi-agent model for analyzing the effects of introducing a transaction tax on one and then on two related stock markets from a structural and behavioral perspective. Our aim is to study if and how market volatility and trading mechanism are influenced by a Tobin tax, and if and how traders change their strategies. Our model is agent-based, and only one asset is negotiated in each market. We developed a simulator acting as an artificial financial market. This computational-experimental approach enabled us to perform several tests and to validate some hypotheses.

The microstructure of the market model is composed of four kinds of traders (Raberto et al., 2003):

- Random traders, who trade at random;
- Fundamentalists, who pursue the "fundamental" value;
- Chartists, trend-followers who are divided into
  - Momentum traders, who follow the market trend;
  - Contrarian traders, who follow the opposite of the market trend.