



# Costs and benefits of financial regulation: Short-selling bans and transaction taxes



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## ABSTRACT

We quantify the effects of financial regulation in an equilibrium model with delegated portfolio management. Fund managers trade stocks and bonds in an order-driven market, subject to transaction taxes and constraints on short-selling and leverage. Results are obtained on the equilibrium properties of portfolio choice, trading activity, market quality and price dynamics under the different regulations. We find that these measures are neither as beneficial as some politicians believe nor as damaging as many practitioners fear.

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## 1. Introduction

Regulatory reform of capital markets is high on policy makers' agenda. Since the 2008 crisis, financial transaction taxes and bans on short selling have seen strong political support. More than 30 countries implemented short-selling bans in 2008, and the dominant member states of the European Union are determined to impose a financial transaction tax on all market participants, including financial intermediaries. Policy makers praise both measures for their ability to stabilize markets. Financial practitioners, in contrast, claim that these regulations reduce liquidity and increase the cost of capital.

While the finance literature emphasizes the impact of regulation on liquidity, price discovery and volatility, economists tend to be more concerned with speculative trading and excessive risk-taking. We attempt to bridge the gap by integrating trading and portfolio management in a numerical model with market microstructure and heterogeneous agents.<sup>1</sup> The goal is to provide

a framework which represents a wide range of potentially important mechanisms, and where the equilibrium effects of these mechanisms can be measured and compared across different regulatory regimes in a coherent manner. To this end, the model offers detailed information on portfolio holdings, order flow, liquidity, cost of capital, price discovery, short-term volatility and long-term price dynamics. Since the interrelation between portfolio holdings, liquidity and trading decisions is likely to be of critical importance during periods of market distress, the model contains an exogenous business cycle process that will enable us to quantify the effect of regulation on long swings in asset prices.

The model is populated by a large number of fund managers who use quantitative strategies to manage portfolios of stocks and bonds on behalf of their clients. Assets can be traded by submitting orders to an exchange which operates a continuous double auction. Competition among funds is modeled as a multiperiod tournament based on past performance. Survival depends on realized performance, with new entrants exerting pressure on low-performing funds by increasing their risk of client attrition.<sup>2</sup> Brown et al. (1996) and Brown et al. (2001) have demonstrated that

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<sup>1</sup> As pointed out by Parlour and Seppi (2008), modeling the interaction between trading and portfolio management is key to understanding the impact of macroeconomic shocks on financial markets.

<sup>2</sup> Busse et al. (2010) find that competition among U.S. equity funds is intense with attrition rates as high as 25% over 3-year horizons.

models of this type capture many of the empirical regularities associated with the entry and exit of managed funds.

To solve the model, we represent the quantitative trading strategies of individual funds as computer programs, and apply a genetic programming algorithm to capture the processes of competition and innovation in the market for portfolio management services. The algorithm operates by arranging tournaments among randomly selected funds at the end of each trading day. In every tournament, the two worst performing funds are replaced by new entrants whose strategies are obtained by copying, crossing and mutating the computer programs of the two best performing ones. We run the model for a large number of trading days and check for convergence to an equilibrium by (a) testing for structural breaks in the relationship between market prices and risk-neutral asset prices, and (b) estimating a stochastic discount factor model to test whether the market prices of the converged model are consistent with a rational expectations equilibrium.

An important feature of this modeling approach is that risk preferences and other trader characteristics are endogenous. In particular, there are no utility functions and no preassigned roles as informed/uninformed, liquidity trader and the like. Instead, the model implements [Alchian's \(1950\)](#) 'as if' view of rational behavior as the outcome of a competitive evolutionary process. It should be emphasized that the absence of explicit preferences and roles entails neither risk neutrality, nor symmetric information, nor otherwise identical agents. Our stochastic discount factor model reveals that market prices are consistent with a rational expectations equilibrium for an economy with a representative agent who maximizes logarithmic utility. At the same time, among individual funds we find substantial heterogeneity in terms of risk-taking, trading activity and information usage. Some funds seek high risk by taking leveraged, speculative positions while others are passive, risk averse investors holding the market portfolio. We also observe specialization on trading styles such as news trading, value trading and market making. Since styles differ by selective use of information, specialization on styles becomes an endogenous source of asymmetric information in the model considered here.

In this paper, we apply the modeling framework to forecast the equilibrium effects of financial transaction taxes and constraints on short selling and leverage. Four regulatory scenarios are considered: (i) A benchmark scenario, calibrated to the S&P 500 index and current U.S. stock market regulations, where trade is subject to initial and maintenance margin requirements and no transaction tax is levied; (ii) a short-selling ban, corresponding to a permanent and global implementation of the ban of short selling that was imposed during the financial crisis; (iii) a ban of all leveraged trade (both short-selling and borrowing); and (iv) a tax of 10 basis points on the value of each trade imposed on both counterparties to the transaction.

### 1.1. Policy implications

The model provides detailed information about the quantitative effects of these regulatory measures. We find that good market liquidity comes at the cost of high short-term volatility and enhanced long swings in asset prices. Informational efficiency of prices, however, can be obtained without regard to the preferred mix of liquidity and market stability. Liquidity is best under the current regulatory regime, while market stability is best under a full leverage ban. A short-selling ban provides a compromise but with the additional benefit of a lower cost of capital. Financial transaction taxes, in contrast, entail costs but no significant benefits.

Although the model captures a considerable amount of institutional detail, it still abstracts from many real-world aspects that

could alter these conclusions. For instance, since the model has only one risky asset and no labor income or consumption, there is little scope for policy reforms to have an impact on the benefits from risk sharing and hedging. Another concern is the cost of information acquisition, which can be expected to influence the effect of regulation on price discovery via incentives to collect and act on information. In this paper, information is freely available, but any strategy that uses it entails model risk, i.e., the strategy might fail in unfamiliar situations. The associated cost is positive for investors who trade on information, and zero for investors with buy-and-hold strategies. Apart from that, we know very little about the magnitude of this cost of using information, and therefore our estimated effects of policy reforms on price discovery are probably off the mark. With these caveats in mind, we continue with a detailed discussion of the results.

### 1.2. Benchmark

The benchmark scenario is characterized by high trading activity in terms of volume, order size and trade frequency, and low transaction costs measured by bid-ask spread and market impact. Average daily turnover is 2.5% of outstanding shares, and the quoted bid-ask spread is approximately 10 basis points.

We observe a high degree of heterogeneity with respect to investment strategies. However, we find that funds can be classified by a small number of common styles which can be interpreted as value trading, news trading/arbitrage and market making/liquidity supply. There is a strong size effect with smaller funds tending to hold extreme positions and submit large orders relative to wealth under management.

The most active traders are leveraged funds with speculative trading strategies. Just over 9% of wealth is held by these funds, but they contribute half of the trading volume. We find that trades by leveraged funds tend to cause transient price volatility which is exploited by informed traders. Leveraged funds are liquidity takers, while funds that make long-term investments in the market portfolio are net liquidity suppliers. We find that speculators, by being net liquidity consumers, stimulate liquidity supply which leads to an increase in market liquidity in equilibrium.

On average, stocks trade at a 25% discount to their risk-neutral price, which suggests that the representative fund is mildly risk-averse. This discount is strongly counter-cyclical. Short selling contributes to high discounts during recessions. In part this is an effect of delegated portfolio management due to the principle-agent relationship identified in [Shleifer and Vishny \(1997\)](#). Short positions are increased when stock prices fall because short sellers outperform the market during these periods. In rising markets, the opposite is true. This leads to counter-cyclical short interest in our model. During recessions, short sellers' positions are bets on bankruptcies or financial restructuring of companies in the real economy. Either event will reduce or even clear their short positions at no cost which implies that the short-term realized performance of short sellers is better than the market average. Occasionally, this mechanism leads to bear runs which aggravate downturns and amplify long swings in asset prices, as measured by the mean stock price decline from a peak in an expansion to a trough in the next recession.

We also observe short squeezes which can occur when some short sellers are forced to buy due to margin violations. When the resulting buy pressure causes the price to rise, more margin calls can ensue which further increases demand for the stock. We find that in these situations funds with leveraged long positions act as sellers. Their supply, however, does not fully satisfy the demand from distressed buyers. By waiting rather than selling now, leveraged long funds keep the option of selling later to even more distressed buyers.

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