Taxing financial transactions in fundamentally heterogeneous markets☆

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ABSTRACT

The recent global financial crisis has revived a long-standing debate on the desirability and feasibility of taxing financial activities to curb speculation and promote price stability. In this paper we apply agent-based computational techniques to explore this issue in a multi-market environment in which the processes driving the fundamental value of the securities traded in different jurisdictions are heterogeneous. A natural exemplification is to assume that security dealers have the opportunity to submit orders by choosing among stock markets at different stages of development. We argue that the proper policy objective to be pursued is not volatility in itself but price efficiency, that is, the volatility in excess of the discounted stream of subsequent dividends. In this case, a global coordination of tax rates is incentive-compatible, given that it minimizes the distortion associated with speculative trading, on the one hand, and it ensures that the loss of trading volume is lower if compared to the case of unilateral taxation on the other. Notwithstanding a fundamental heterogeneity of the markets involved, the optimal tax rate turns out to be symmetric provided that fundamental value trajectories are positively correlated.

1. Introduction

A key by-product of the 2007-08 global financial turmoil has been a profound rethinking of the set of policy responses that need to be deployed to curb systemic instability. Implicitly assuming that the stunning volatility and skyrocketing trading volume currently observed in securities markets might be the flip side of a disproportionate accumulation of risk by traders, in September 2009 the G-20 leaders brought back into the spotlight a renowned proposal long ago advanced by Keynes (1936) and Tobin (1972, 1978): to limit short-term speculative activities by means of Financial Transaction Taxes (FTTs) (IMF, 2010). Rephrasing Tobin, this amounts to throwing a few grains of sand in the well-greased wheel of financial markets, with the aim of constraining the negative impact that speculation exerts on systemic risk.

Although the idea of taxing financial transactions has been extensively applied all around the world since the 1980s (Matheson, 2011), mixed evidence on the actual ability of FTTs to contain market volatility[1] has spurred a highly animated debate. The long-standing stalemate experienced by EU governments in finalizing a harmonized

regional levy on financial transactions is paradigmatic of the objections commonly raised against this scheme, as well as of the major hindrances encountered on the road to an effective international coordination in its application (Kitromilides and Gonzáles, 2013).[2] Critics argue that a FTT is disproportionately costly to administer; leads to a hazardous drop of transaction volume and market liquidity; slows down price discovery; and, as a final drawback, shrinks efficiency. Last but not least, any attempt to impose unilaterally a levy on domestic financial transactions in a world where capital can flow freely across borders will redirect buying and selling activities towards jurisdictions where exchanges are taxed at a lower rate, if at all.

All these potential drawbacks were fully acknowledged by the original proposers of FTTs. In particular, Tobin (1972, 1978) suggested that any feasible international arrangement aimed at imposing an effective FTT should foresee the use of a (tiny) uniform tax rate, a position that we dub the *Tobin conjecture* since a formal proof of its validity is still lacking. Besides easing agreements by allowing negotiators to reason on a single number, the conjecture maintains that a common tax rate would yield the key benefit of sterilizing the cross-country negative spillovers associated with the tax. Is this belief

[1] See Baltagi et al. (2006) and Hau (2006).
[2] For an overview on the current state of the debate among EU members, see "Eurozone Financial Transaction Tax Plan Stalls, Says Minister" (http://www.wsj.com/articles/eurozone-financial-transaction-tax-plan-stalls-says-minister-1457606638; last accessed on December 10th, 2016).

confirmed when asset markets are structurally heterogeneous, so that the same tax rate can exert different impacts on asset valuation and trading volume?

Our question is motivated by results recently emerged in two distinct streams of literature. First, a large body of econometric evidence has shown that international markets are indeed characterized by diverse dynamics due to differences in the speed with which news is incorporated into the present value of subsequent dividends (Andersen et al., 2007), informational efficiency (Griffin et al., 2010), risk-return profiles at different stages of development (Kohers et al., 2006), or the degree of macroeconomic volatility (Easterly et al., 2001). Second, research conducted with experimental methods has highlighted that alternative assumptions on the time path of the fundamental value of an asset generate significant differences in the degree of mispricing (Breaban and Noussair, 2014; Stöckl et al., 2015). A combined appraisal of these findings supports the view that any attempt to validate the Tobin conjecture should seriously take into account that international financial markets are characterized by a significant heterogeneity in the time path of intrinsic asset values, and that this heterogeneity is likely to have serious implications as regards market efficiency for any given tax rate.

In order to address this issue, in what follows we employ agent-based modeling techniques. These involve simulating on a computer the dynamics of a stock market populated by a large number of interacting heterogeneous artificial traders (Hommes, 2006; LeBaron, 2006). Since these models are able to replicate many of the stylized facts characterizing financial market data with parsimonious analytical structures, the basic idea consists in using them as computer-based laboratories to conduct policy experiments, where alternative assumptions on trading strategies and market protocols can be tested in a controlled environment. Several papers have already applied this approach to assess the impact of FTTs on asset market outcomes,[3] yielding three main conclusions. First, in a market in which traders can endogenously switch between technical and fundamental trading rules or remain entirely idle, the imposition of a FTT causes a reduction in volatility that depends on the proportion of chartists retreating from trading or switching to a fundamentalist strategy. Second, the drop in volatility is associated with the liquidity secured by the market microstructure, since liquidity is inversely related to the price responsiveness of any given order. Third, when agents are allowed to operate in several interconnected markets, unilaterally introducing a tax generates a negative spillover, in that the taxed market is stabilized at the expense of an increased volatility on the untaxed ones.

Building on a prototypical small-type agent-based asset market model, the main novelty of this paper is that it studies how efficient price discovery is affected by alternative assumptions on the stochastic process driving the intrinsic value of the asset. In particular, we will admit the possibility that the fundamental value of the securities exchanged in different markets may vary along two dimensions: i) the speed with which any news is incorporated into intrinsic values; ii) the efficiency with which the additional items of information are priced in.

Contrary to the received wisdom from the bounded rational heterogeneous agent literature (see e.g. Westerhoff, 2010), we show that price efficiency is significantly affected by the path of the fundamental, a result that corroborates the experimental evidence obtained in laboratory asset markets with distinct fundamental value regimes. Our augmented model is then used to test the Tobin conjecture. We find that the strategy of levying symmetric FTT rates is indeed optimal even after cross-market structural heterogeneity is taken into account, provided that the time paths for the fundamentals

are positively correlated. This requirement for the Tobin conjecture to hold true is far from being restrictive in practical terms, given that it is fully consistent with the evidence showing that news affecting fundamentals on pivotal markets (like those of the U.S. and Japan) is transmitted, albeit with varying responses, even to geographically distant jurisdictions (Wongswan, 2006, 2009; Hausman and Wongswan, 2011). When a coordinated tax scheme is applied, the endogenous evolution of trading strategies across the population of agents generates a concave relationship between tax rates and market efficiency directly related to the market share of investors adopting fundamental forecasting rules. In fact, an international coordination in setting a common tax rate enables participants to achieve two results simultaneously: i) increase market efficiency globally; ii) individually maximize tax revenues in comparison to the case of a unilateral imposition. This implies that coordinating on a symmetric tax rate is an incentive-compatible solution even for heterogeneous jurisdictions as soon as information on fundamentals originating in one market is important for other markets.

The rest of the paper is organized as follows. Section 2 presents the analytical structure of our modeling approach. Section 3 sets out simulation results showing the model's degree of accuracy in capturing several stylized facts of real financial markets, and an assessment of how alternative assumptions on the dynamics of the fundamental affects market outcomes. Section 4 studies the impact of FTTs in a multi-market fundamentally heterogeneous environment. Section 5 concludes.

2. The market environment

The rationale for levying a Pigouvian tax on financial transactions must be grounded on some sort of market inefficiency. Observed price volatility in itself is not a sufficient argument, given that it may represent the optimal response of rational traders to news about the intrinsic value of the underlying asset. If this were the case, the main prescriptions of the efficient market hypothesis (EMH) would be entirely fulfilled and the tax would be merely distortionary. Since the pioneering work of Shiller (1981), however, a huge amount of empirical evidence has persuasively shown that stock prices move too much to be justified by subsequent changes in dividends; a feature which is today universally known as *excess volatility*. Accordingly, the proper purpose of FTTs should be to shrink the price volatility in excess of that associated with the path of the fundamental value.

Fig. 1, taken from the background paper issued by the Economic Sciences Prize Committee of the Royal Swedish Academy of Sciences (2013) to celebrate the award of the Nobel Prize to Shiller himself, clearly illustrates the point. The solid line p traces the evolution of the S & P Composite Stock Price Index over the period 1871–1979, expressed in real terms and detrended by means of a long-run exponential growth factor. The dotted line p^* is the present value of actual subsequent real detrended dividends, representing the optimal price forecast. The distance between the two lines is therefore a measure of the extent to which the market violates the EMH or, to put it differently, the degree of market inefficiency. It appears that the actual price dynamic is characterized by (i) severe bubbles and crashes with respect to its fundamental value, (ii) a slowly mean-reverting pattern, (iii) an underlying fundamental that varies as well, although at a much lower frequency.

A persuasive explanation of the first two features – boom-and-bust dynamics and slow mean-reversion – can be obtained by means of an agent-based asset pricing model in which traders are allowed to switch among heterogeneous strategies from one trading period to the next. In a typical 2-type agent-based model, for instance, each trader can choose between a fundamentalist forecasting rule, according to which asset prices are expected to return to their fundamental value, and a chartist forecasting rule based on the assumption that prices move in trends. The probability of fundamental traders switching to technical

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[3] Key contributions are Westerhoff (2003), Ehrenstein et al. (2005), Westerhoff and Dieci (2006), Mannaro et al. (2008), Pellizzari and Westerhoff (2009), Demary (2010) and Fricke and Lux (2015).