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Discussion

Comment on: “The intended and unintended consequences of financial-market regulations: A general equilibrium analysis” by Adrian Buss, Bernard Dumas, Raman Uppal, and Grigory Vilkov

Johan Walden *

Haas School of Business, University of California at Berkeley, 545 Student Services Building #1900, CA 94720-1900, United States

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1. Introduction

In the aftermath of the financial crisis, the fundamental questions of how to think about welfare and regulation in speculative financial markets have received renewed attention, see Brunnermeier et al. (2014), Gilboa et al. (2014), Gayer et al. (2014), Dávila (2014), Heyerdahl-Larsen and Walden (2014), and Blume et al. (2014). The paper by Buss, Dumas, Uppal, and Vilkov (BDUV) addresses these fundamental, challenging, and timely questions.

A starting point for this strand of literature is that speculative trading between agents with heterogeneous beliefs, although typically increasing these agents' individual expected utilities, is costly from a welfare perspective since some agents must necessarily be wrong in their beliefs. Speculation, instead of creating welfare by allowing agents to hedge risks and smooth consumption across states, actually generates volatility of consumption and wealth at the individual level, and is therefore costly. Welfare measures have been introduced that require a social planner to evaluate an allocation using a common belief across agents, in contrast to the ex ante efficient Arrow optimum, which is based on agents' individual beliefs, see Starr (1973). Consequently, speculative trades are not viewed as welfare increasing with such measures. The policy implications are significant: The frictionless complete market equilibrium is typically no longer efficient and the regulation of trades may be welfare increasing.

BDUV study the consequences of regulation in an especially challenging context, namely that of a general equilibrium production economy with idiosyncratic labor productivity shocks. In an exchange economy, in which agents face no idiosyncratic risk (e.g., from labor income), the analysis is quite straightforward: Since the sole function of trade is to allow for speculation, the speculative markets should be shut down. In a richer environment, in which the markets have the additional roles of allocating productive resources and allowing agents to share idiosyncratic risk, the situation is more complex. The introduction of regulatory measures that constrain trades will in equilibrium decrease speculation, which is welfare increasing, but also hinder risk sharing, which is welfare decreasing. The measures will typically also affect real investments,

* Tel.: +1 510 643 0547; fax: +1 510 643 1420.
E-mail address: walden@haas.berkeley.edu

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the welfare effect of which is a priori unclear. To understand the total effect of introducing a regulatory measure, these effects need to be weighed against one another.

Adding to the challenge is the fact that even defining welfare in a production economy is less straightforward than in the exchange economy setting. In the exchange economy, the social planner determines how to divide a fixed-size consumption stream between the agents in the economy, whereas in the production economy the planner also needs to take a stand on how much should be invested in production, the benefits of which agents typically disagree about. BDUV provide a welcome contribution to this literature.

2. Model and results

BDUV introduce a two-agent, two-asset, T-period, incomplete market general equilibrium model with production and idiosyncratic shocks. Agents have Epstein and Zin (1989) preferences, allowing for the separation of the risk-aversion coefficient, γ, and elasticity of intertemporal substitution, ψ, although most of the paper focuses on the case with $\gamma = \frac{1}{\psi}$, for which it is known that these preferences collapse to regular CRRA preferences.

Production follows the dynamics of a standard growth model with two regimes and convex costs of capital adjustments. The law of motion for capital is

$$K_{t+1} = (1-\delta)K_t + I_t - \frac{\xi}{2}\left(\frac{I_t}{K_t}\right)^2 K_t,$$

where I_t is the time-t investments, δ is the depreciation rate and ξ the coefficient of cost of capital adjustment. Total time-t output is $Y_t = Z_t \times K_t \times L_t^{1-\alpha}$. Here, L_t=1 is the aggregate labor, which is in inelastic supply, and Z_t represents stochastically growing productivity. Aggregate consumption at time t is $Y_t - I_t$, of which $W_t L_t$ is paid through wages, and $D_t = Y_t - I_t - W_t L_t$ is paid through dividends to the owners of a representative firm.

The two agents, $i \in \{1,2\}$, face idiosyncratic labor productivity shocks. The fraction of labor supplied by each of the two agents is $e_{1,t}$ and $e_{2,t} = 1 - e_{1,t}$, respectively, where $e_{1,t}$ follows a two-state Markov process. This introduces a hedging motive for trading in financial markets.

There is also a two-state hidden Markov process, $x_t \in \{1,2\}$, which is related to whether aggregate productivity growth, $\frac{Z_{t+1}}{Z_t}$, is high or low. Finally, there is an independent binary signal, $s_t \in \{1,2\}$, which agents mistakingly believe is also related to aggregate productivity growth. The two agents agree to disagree about the information contained in s_t, in such a way that they are both equally biased. They disagree about whether a high realization of s_t is related to a high or low value of x_t. The difference in opinions introduces a motive for speculative trading.

The financial market contains two assets: a one-period risk-free bond and a stock that represents a claim to the future aggregate dividend stream. The market is therefore inherently incomplete: in each period there are three shocks but only two assets. An equilibrium in the frictionless benchmark economy is defined as an outcome of asset prices and real variables, in which agents optimize expected utility of consumption and investments with respect to their own beliefs, with no constraints on trading beyond the budget constraint, the firm maximizes its value with respect to ownership-weighted state prices, and all markets clear. The problem is defined such that it is ex ante symmetric: each agent is expected to start with the same wealth and equally biased beliefs.

The model is solved numerically, using the recently developed method in Dumas and Lyasoff (2012). The main focus of the analysis is on the welfare effects of three different regulatory measures: stock-portfolio constraints, borrowing constraints, and a transaction (Tobin) tax. In a calibrated example, it is shown that compared with a frictionless equilibrium without regulation, each of the three measures substantially decreases speculative trading. This has a positive welfare effect. To a varying extent, each of the measures also decreases risk sharing, which has a negative effect on welfare. Importantly, the transaction tax is more efficient than stock-portfolio constraints in decreasing speculation, while still allowing the agents to take on significant positions in the two assets and thereby share risks. Borrowing constraints are also relatively effective. Of the three regulatory interventions, the introduction of stock-portfolio constraints is therefore least effective in this environment.

3. Comments

As mentioned, understanding the welfare costs of speculation and how regulation may decrease these costs are fundamental, challenging, and timely questions, and the paper by BDUV provides a welcome contribution. The results in the paper provide a nice starting point for approaching these questions, that subsequent literature can build and expand upon, although I will argue that further robustness tests are needed. Also, I note that the dynamic problem BDUV study, with incomplete markets and production, and with multiple agents, shocks, and assets, is challenging, and the fact that the numerical method in Dumas and Lyasoff (2012) can be used to readily solve the problem is interesting in itself.

Of course, there are limitations associated with using a numerical solution approach. Especially, it may be difficult to verify the general validity of results from numerical calibrations and examples. For example, a general analysis of the relationship between agents' risk preferences, γ and ψ, equilibrium growth rates, and associated welfare costs, would help identify the underlying drivers behind the results, but may be out of reach with the current numerical approach. The current approach, however, may be used to show possible equilibrium effects of introducing regulatory measures, based on specific examples. For example, one may show that the welfare effects of a transaction tax are ambiguous (since it limits both speculation and risk sharing). That the results may go either way is quite unsurprising, and also well known at this point though (see, e.g., Dávila, 2014 and references therein), and BDUV push their analysis further by calibrating the model. A calibration, rather than merely showing possibilities, may be used to conclude that although the effects of regulation are in general ambiguous, for the parameter region that is relevant in practice they are not. To draw such inferences, the results need to be robust to reasonable alternative specifications.

The calibration parameters in BDUV (shown in their Table 1) are within reasonable ranges, except for the assumed labor productivity shocks which are very large and frequent. The need for large shocks in their model is related to the equity premium puzzle: under reasonable joint assumptions about risk and risk aversion, agents in the model simply do not care as much about risk as needed to match observed dynamics. The authors suggest that less extreme values would be needed if the number of agents increased. Given the focus of the paper on effects of speculation rather than on risk premia, the exaggerated parameter choice is likely not pivotal.

For robustness, BDUV also study multiple variations of the base model. Specifically, they shut down parts of the model (disagreement, labor productivity shocks), and vary preferences parameters (γ and ψ). I argue that more can be done going forward, to confidently conclude that one regulatory measure is more effective than others in practice. I mention two variations that I view as especially important.

First, the authors avoid most of the challenges of measuring welfare under heterogeneous beliefs by making clever modeling choices and specific assumptions about the planner's objective function. Specifically, the setting in the model is such that the problem is ex ante symmetric: both agents have the same wealth, the same preference parameters, and the same size of their biases. Their future consumption streams are therefore identical in distribution, and the planner's Pareto weights are irrelevant.

This is obviously a knife-edge situation, and one may expect the effectiveness of the different regulatory measures to be less clearcut in a more general setting, where one investor may be more sophisticated than the other, their wealth and shock distributions are not symmetric, and the planner puts different Pareto weights on the two agents. In such a setting, the wealth transfer from unsophisticated to sophisticated agents may well be viewed as welfare improving by a planner who favors the sophisticated agent. The authors' approach of studying the consumption paths of the two agents separately addresses the Pareto weight issue, but still only in the ex ante symmetric case.

Another assumption made is that the planner uses a specific probability distribution in the welfare measure, namely that of the econometrician. It has been argued elsewhere (e.g., in Brunnermeier et al., 2014 and Heyerdahl-Larsen and Walden, 2014) that welfare in this context should take all agents' individual beliefs into account, e.g., by requiring an allocation to be an improvement for all probability distributions in the convex hull of individual agents' beliefs, to be identified as an improvement. The bar for an allocation to be identified as an improvement is clearly significantly higher with such a measure, since it must be robust under multiple probability distributions.

The specific assumption made about the probability distribution may be justified in some situations, when agents' individual beliefs are obviously irrational. In other situations, however, it may be a stretch to assume that the planner can form beliefs that are superior to those of the individual agents. There are, e.g., many historical examples of asset bubbles, about which there was significant disagreement before the crash occurred, even among sophisticated investors and regulators. The subprime mortgage crash is one such recent example.

Second, one may conjecture that the asset structure in the economy should be important for the outcome. A standard assumption in the literature is that there is a representative firm and a bond in zero net supply in the market. In a representative agent setting, such an assumption is quite innocent, but for the question at hand it may be less so, since the wealth transfer and related welfare losses in the heterogeneous beliefs model depends on the possibility for agents to speculate by taking on *different* portfolios. The actual asset structure in the market should therefore be important. Fedyk et al. (2013), for example, show that the wealth transfer from unsophisticated to sophisticated investors in complete markets is typically higher when the asset span is richer.

Importantly, one may expect the trade-off between risk sharing and speculation in the market to depend on how closely the traded assets are related to these different risks that agents are exposed to and generate. For example, if agents' labor productivity shocks were directly correlated with the performance of traded assets, in contrast to BDUV's model, the prospects for hedging such risk in the market would increase, potentially affecting the impact of different regulatory measures. Financial innovation, see Simsek (2013), may even endogenously change the effectiveness of regulation, through the introduction of assets that meet regulatory constraints but still allow for speculation. For example, the introduction of a derivative that allows agents to speculate without dynamic portfolio rebalancing may mitigate the effectiveness of a transaction tax.

To conclude, BDUV take a welcome step in furthering our understanding of the effect of regulation on welfare in speculative markets with heterogeneous beliefs. Further analysis of the robustness and key underlying drivers behind the results are natural next steps for addressing the important questions studied in their paper.

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