Tapping the Brakes: Are Less Active Markets Safer and Better for the Economy?

Joseph E. Stiglitz

University Professor, Columbia University

Tapping the Brakes: Are Less Active Markets Safer and Better for the Economy?[1]

Joseph E. Stiglitz

Capital markets are sensitive to quick changes in sentiments. Sometimes those changes are related to real changes in the economy, or more accurately, to new information about potential changes in the economy in the future—the discovery of large amounts of gas, unanticipated changes in monetary policy, the break-out of war, the breaking of a bubble. In many cases, these events or the new news had been *partially* anticipated. It was possible that war would break out. But the break-out of a war changes what was a possibility, or even something that had a high likelihood of occurring, into a certainty.

But often, those changes in sentiments are related to perceptions, to beliefs, which can spread across the investment community, with little relationship to underlying fundamentals. Rob Shiller and others have documented that much of the variation in stock market prices cannot be explained by changes in fundamentals, or news about changes in fundamentals[2]. There was nothing so dramatic unveiled in October 1987 that could come any way near accounting for the wiping out of a quarter of the value of the stock market. There were no changes in the fundamentals that could account for the wiping out of a trillion dollars of stock market value in the flash crash of May, 2010.

Keynes talked about these changes in sentiments in terms of animal spirits. Using a context that today would be viewed as politically incorrect, he focused on the market as a beauty contest, where the objective was not to ascertain the "fundamentals," but rather to assess what others were thinking. Modern research in psychology, sociology, and social psychology has begun to explore how each of our beliefs are shaped by those around us; there can be contagion—spirits of optimism and pessimism can spread. (There can also be rational expectations contagion— actions of individuals can convey information; but the observed patterns entail more than this.[3])

Keynes was very clear in his view that markets could be excessively active. There are many forms that such excessive activity can take. There can be excessively *rapid* transactions (associated with high frequency trading); relatedly, holding periods can be excessively short; there can be excessive short-term cross-border capital flows; or there can be trading in new

[2] See Shiller (1981).

[3] The extent of such rational herding and the consequences will depend on the information that is available and the rules of the game. See a survey paper on rational herding in financial markets by Andrea Devenow and Ivo Welch (1996).

products, like derivatives or CDS's. Each of these forms of transactions has come under scrutiny, in popular discussions[4], within the academic literature, and among policymakers. (Not surprisingly, those engaged in these transactions have robustly defended them, often citing academic studies in support of their position.)

In this paper, I provide a brief, mainly theoretical, survey of some of the key issues. I begin (in section I) with a brief reference to two basic theoretical propositions, which should frame discussions in this area: there is no presumption that unfettered markets lead to (Pareto) efficient outcomes, or even that movements towards "better" markets lead to welfare improvements.

Section II. focuses on a well-studied context--that of capital market liberalization--where there is now a broad consensus that unfettered markets are welfare decreasing. The remainder of the paper is devoted to areas in which research is more recent. Section III focuses on one aspect of "excessively active markets," cross-border capital flows. Sections IV and V focus on high frequency trading--section IV on the alleged benefits in terms of improved price discovery, section V on the alleged benefits in terms of greater liquidity. Section VI concludes with remarks about other ways in which markets may be excessively active, e.g. in the creation of derivatives, and with policy responses.

I. Two general propositions

Many advocates of unfettered markets begin with the presumption that markets, on their own, will be efficient. This was Adam Smith's fundamental insight, reflected in the First Fundamental Theorem of Welfare Economics. But for more than three decades, we have understood that markets in which there is imperfect and asymmetric information and imperfect risk markets are not in general constrained Pareto efficient.[5] Privately profitable contracts and investments may be socially undesirable. Greenwald and Stiglitz show that, in general, pecuniary externalities matter.

Financial markets are inherently about information. Indeed, one of the arguments for more active markets is that they do a better job at revealing information. But even if that were true, it does not mean that welfare is increased. The analysis below will suggest that the presumption is in fact to the contrary--consistent with the Greenwald-Stiglitz theorem.

There is a second, widespread presumption: even if we are not in the ideal world, e.g. with a full set of Arrow-Debreu securities, moving towards that would be a Pareto improvement. Such reasoning underlies arguments for creating more markets--and opposing government restrictions

---

[4] Most recently, high frequency trading has come under scathing criticism from Lewis (2014) and Patterson (2012).
[5] See Greenwald and Stiglitz (1986) and Geanakoplos and Polemarchakis (1986). Constrained Pareto efficiency simply refers to the fact that the costs of obtaining information and creating markets are included in the analysis.

on markets.   Again, for a long time, since the work of Meade and Lipsey and Lancaster in the theory of the second best, we have known that that is in general not the case.

A forceful example illustrating both propositions concerns trade liberalization in a world with risk but incomplete risk markets. It has long been recognized that in that case, free trade can, in quite plausible circumstances, lead to a Pareto inferior equilibrium--in which all market participants, in all countries, are worse off.[6]

II. Capital market liberalization[7]

Globally, the changes in sentiment to which we referred earlier can give rise to large capital flows, and when countries do not impose capital controls (or some other form of capital account management) and allow exchange rates to vary freely, this can give rise to high levels of exchange rate volatility. The consequence can be high levels of economic volatility, imposing great costs on workers and firms throughout the economy. Even if they can lay off some of the risk, there is a cost to doing so. The very existence of this volatility affects the structure of the economy and overall economic performance. In short, there are large externalities arising from short-term capital flows, which those who engage in them do not take into account.   It is thus no wonder that capital market liberalization, leading to excessive cross-border flows, can lead to higher volatility, but not higher growth[8]; and that economic performance can be improved upon by imposing restrictions on this excessively active market.

 Within the realm of international finance, since the Global Financial Crisis, there has been a major rethinking of the appropriate policy framework for responding to this volatility. There is an emerging consensus, including at the IMF, that countries should engage in some form of capital account management[9], and some form of capital controls. Such controls entail both ex ante measures (restricting the free flow of capital into a country) and ex post measures (restricting outflows in the event of a crisis.)   Capital account management techniques may involve both price and quantity interventions. At the same time, there is a growing body of theoretical and empirical research supporting these new policy positions.[10]

---

[6] Newbery and Stiglitz (1984)

[7] My views on capital market liberalization were shaped not only by the theoretical and empirical research described in this paper (see also, for instance, Hellman, Murdoch, and Stiglitz, 1998, 2000), but by my firsthand involvement in a large number of financial crises (East Asia, Argentina, Russia, Turkey), in many of which the flows of short-term capital that had resulted from capital market liberalization played a central role. See Furman and Stiglitz (1999) and Stiglitz (1999).

[8] See, for example, Rodrik (2007), Demirgüç-Kunt and Detragiache (1998)

[9] See, for example, Korinek (2011a)

[10] Even before the crisis, there was a large body of theoretic al and empirical work arguing for restrictions in cross border capital flows, and more broadly, strong regulations of financial markets. Critics of capital account liberalization had long pointed out that, while there was compelling evidence that capital account liberalization did

3

Earlier, we referred to the Fundamental Theorem on the Inefficiency of Markets with Imperfect and Asymmetric Information and Incomplete Risk Markets. More recent theoretical research has fleshed these ideas out in terms of macroeconomic externalities, showing for instance that the amount and form of indebtedness will not be optimal, leading to excessive market volatility.[11]

While within international policy circles the idea that unfettered markets lead to excessive volatility—and that there is accordingly a role for government to intervene, to "tap on the brakes"—is now well accepted, there is evidently some controversy in the context of domestic markets. In this brief note, I want to explore several aspects of this long standing debate.

III. Price Discovery and Efficient Markets[12]

Advocates of unfettered markets advance two arguments against restrictions: that such restrictions interfere with the price discovery mechanism and reduce the liquidity of markets. In this section, we take up the first issue.

But first, I want to emphasize what should be the underlying question: whether restrictions on these activities would lead to a higher level of social welfare (somehow defined). The variables on which much of the academic literature has focused are intermediate variables: the link between a change in some correlation or the volume of trade in a market and societal welfare has to be established. It cannot be assumed. Is societal welfare made better, for instance, because there is a better allocation of *real* resources, so growth is higher? The arguments presented below leave me skeptical about the social value of high frequency trading.

---

lead to more volatility, and played an important role in many of the crises around the world, there was scant evidence that it improved economic growth and performance. Indeed, if one used the kinds of "better" measures of economic performance now being recommended (e.g. by the International Commission on the Measurement of Economic Performance and Social Progress (Fitoussi, Sen, and Stiglitz, 2010)) taking into account impacts on inequality and the costs of insecurity associated with volatility, it is likely that one could establish a strong negative relationship with capital market liberalization.   For a sampling of this earlier literature, see Caprio *et al*, 2001, Stiglitz and Ocampo (2008), and Stiglitz, Ocampo, Spiegel, Ffrench-Davis, and Nayyar (2006). After the crisis, these positions became even more accepted. See, e.g. Commission of Experts of the President of the United Nations General Assembly on Reforms of the International Monetary and Financial System (2010), Blanchard *et al* , 2012, Korinek (2011b), and Korinek and Jeane (2011).

[11] See also Korinek and Jeane (2010), Korinek (2011c, d, e), Stiglitz (2008)

[12] Most of the theoretical ideas articulated in this section were formed as I participated as a member of the CFTC-SEC Advisory Committee on Emerging Regulatory Issues, which focused on the 2010 flash crash, its causes, and the appropriate responses. As part of the work of the Commission, we talked to large numbers of market participants, examined large reports of the events surrounding the crash, and evaluated alternative proposals. The Report of the Commission ("Findings Regarding the Market Events of May 6, 2010") is available at http://www.sec.gov/news/studies/2010/marketevents-report.pdf. Since then, there have been a large number of studies of high frequency trading, some of which are describe below. There is an excellent survey Biais and Woolley (2011) which comes to many of the same conclusions.

Analytically, we need to divide the discussion into three parts: In the first, the information of each market participant is given (except what it can extract from observing prices or behavior of others). In the second, information of some market participants about fundamentals is endogenous. In the third, the "real" investments themselves are endogenous.

High frequency trading operates in a span of time in the first sphere. As such, it is mostly a zero sum game--or more accurately, a negative sum game because it costs real resources to win in this game.[13] There is a fixed amount of money that goes somewhere. Gains to one party come at the expense of money that would have gone to others. But defenders of HFT argue that there is a link between this negative sum first stage game, and the two more fundamental levels. There is, though the links are more likely to reinforce the view that such activities are not welfare enhancing.

In evaluating the benefits of price discovery, there are two separate questions: (a) What is the *social* value of price discovery? Advocates of unfettered markets simply *assume* that there is a social value, and that that social value is greater than any costs, e.g. associated with the collection and processing of information or of any increased volatility that might result. (b) Is it possible that some restrictions on markets might make markets more informative? Again, advocates of unfettered markets typically *assume* that less restricted markets are more informative.

The social value of price discovery. A market economy could not operate without prices. But that does not mean that having *faster* price discovery, or even *more* price discovery necessarily leads to a Pareto improvement.

These points have been recognized for a long time in more general contexts.

For instance, the argument for flash trading is that it improves price discovery *a little bit* by making prices reflect underlying fundamentals more quickly than they otherwise would. But there are costs associated with slight improvements in the quality of information, and there is a general theorem (using general results in the theory of statistical decision making) suggesting that the costs of slight improvements in information may outweigh the benefits.[14]

There are also general equilibrium effects: in the context of screening models, in which more informative systems do a better job in differentiating among, say, individuals who otherwise would appear to be the same, but differ in their ability, there may exist an equilibrium with better price discovery which is Pareto inferior to one with poorer price discovery.[15]

---

[13] As we shall note, even in this first stage seemingly zero sum (or negative sum) game, there can be welfare gains from an ex ante perspective. The significance of these gains can, however, be questioned.

[14] See Radner and Stiglitz, 1984.

[15] See, e.g. Stiglitz (1975). This is true whether or not the information which is available to each individual before market interaction is endogenous or not. Stiglitz (1984)

There can also be macroeconomic externalities associated with price discovery[16]; and again, a macroeconomic equilibrium with "better" price discovery can, not surprisingly, have higher levels of volatility[17] and lower levels of welfare.

The social value of earlier price discovery. There are, however, a few more specific points that I wish to raise here. The first is that there may be little or no social value in obtaining information *before* someone else, though the private return can be quite high. The private return can increase, at least in part, from taking "rents" that otherwise would accrue others. And because the private return can exceed the social return, there will be excessive investments in the speed of acquisition of information.[18] If there is one umbrella, and there is a 50/50 chance of rain, if neither of us has any information, the price will reflect that risk. One of us will get the umbrella. If it rains, that person will be the winner. If it does not, the other person will be the winner. Ex ante, each has the same expected utility. If, now, one person finds out whether it's going to rain, then he is always the winner: he gets the umbrella if and only if it rains. If the other person does not fully understand what is going on, he is always the loser. There is a large redistributive effect associated with the information (in particular, with the information asymmetry), but no real social benefit. And if it cost anything to gather the information, then there is a net social cost.[19]

There may be some social value in providing information that allows better matching of securities with individual's needs, i.e. taking into account risks they face in their non-traded assets, such as their human capital. But there are two objections to this argument. First, the evidence is overwhelming that this is not what is occurring in the stock market.[20] And secondly, the information that is produced as part of the alleged improvement in the price discovery function by HFT is too coarse to be of any value in this respect.

---

[16] E.g. originating from changes in the value of collateral. See Kiyotaki and Moore (1997).

[17] At this juncture, I am not evaluating the empirical proposition of whether HFT leads to more price volatility. We are focusing on the analytic proposition: price discovery (more informative systems) differentiate among states of nature which otherwise would be treated the same, and in this sense necessarily increase price volatility. There is a mean preserving increasing in risk, in the sense of Rothschild and Stiglitz.

[18] The argument is parallel to that for why patent races can be inefficient. The winner of the patent race gets the entire monopoly rent associated with the patent. The social return is, however, only the present discounted value of the consumer surplus associated with getting the innovation *earlier* than otherwise would have been the case. See Hirshleifer, 1971.

[19] If the other individual knows that the other party knows next period's weather, he will know that if the other party bids for the umbrella, it is because he knows it will rain. Thus, his willingness to bid conveys perfectly the information from the informed to the uninformed. In that case, the price will reflect the value of the umbrella, but the informed individual will have no advantage. But that means that he would not invest any amount to acquire information. (We will elaborate on this point later.) Note that in this case, there is no social value to the information. In a market with many individuals (informed and uninformed), if umbrellas are being used as collateral for some loans, the volatility in the price of umbrellas can have adverse macroeconomic consequences. Obviously, matters are more complicated if the individual obtains some but not perfect information about the likelihood of rain.

[20] See Stiglitz (1982) and the discussion preceding it in the 2009 reprinting.

Does HFT lead to better price discovery in the relevant sense? We now come to the second level of analysis, where individuals make a decision about the acquisition of information (but the real investments are still fixed.) Once we broaden the analysis to including endogenous investments in information, there is an even more fundamental point: it is not obvious that more trading (e.g. flash trading) will result in the markets performing price discovery better. The reason is simple, and related to the Grossman-Stiglitz refutation of the efficient markets hypothesis[21]. They pointed out that if the market instantaneously and fully conveyed information from the informed to the uninformed, it would not pay anyone to obtain information. If it were true that markets were informationally efficient, it would thus mean that they would only convey costless information. The market would, in some sense, be very uninformative, even though it conveyed all the information that had been acquired. That in turn would mean that if there were a social value to price discovery, the market could only perform that function well if it were not informationally efficient. Grossman and Stiglitz show that there can in fact exist *an equilibrium amount of disequilibrium*, where prices do not fully convey all the information from the informed to the uninformed.

But how much gets conveyed can depend on how the market is organized, the rules of the game. If I know that you have perfect information about whether it is going to rain, then if I see you put *any* bid in for an umbrella, I know that it is going to rain. If I can observe not just price but order flow I may be able to extract more information than if I can observe just price. Market making can be profitable, because the market makers have an informational advantage.

By the same token, if sophisticated market players can devise algorithms that extract information from the patterns of trades, it can be profitable. But their profits come at the expense of someone else. And among those at whose expense it may come can be those who have spent resources to obtain information about the *real economy*. These market players can be thought of as stealing the information rents that otherwise would have gone to those who had invested in information. But if the returns to investing in information are reduced, the market will become less informative. Better "nanosecond" price discovery comes at the expense of a market in which prices reflect less well the underlying fundamentals. As a result, resources will not be allocated as efficiently as they otherwise would be.[22]

Further distortions. There is an additional level of distortions: the informed, knowing that there are those who are trying to extract information from observing (directly or indirectly) their actions, will go to great lengths to make it difficult for others to extract such information. But these actions to reduce information disclosure are costly. And, of course, these actions induce the flash traders to invest still more to figure out how to de-encrypt what has been encrypted.

---

[21] Grossman and Stiglitz, 1980.
[22] It is worth noting that none of the empirical results establish that as a result of HFT prices better reflect fundamentals.   They only show that they have done a good job at eliminating some arbitrage opportunities, e.g. reflected in serial correlations. (See Chaboud *et al,* forthcoming.)   The reduction of autocorrelation is also consistent with an uninformative price system.

7

If, as we have suggested, the process of encryption and de-encryption is socially wasteful—worse than a zero sum game--then competition among firms to be the best de-encryptor is also socially wasteful. Indeed, flash traders may have incentives to add noise to the market to disadvantage rivals, to make their de-encryption task more difficult. Recognizing that it is a zero sum game, one looks for strategies that disadvantage rivals and raise their costs. But of course, they are doing the same.

Moreover, fear that the benefits of their research will be stolen through what many might call sophisticated front running (when there is an advance feed, it doesn't even have to be very sophisticated) induces those engaged in fundamental research to turn away from markets to dark pools. Society loses the advantage of transparent markets, and these dark pools may also be subject to market manipulation. Overall, there is a loss of confidence in markets.

The ambiguous effects of better price discovery. In the "second best world" of imperfect and asymmetric information and incomplete securities markets, having prices better reflect information has, in general, ambiguous effects: there is a social cost associated with the increased price volatility[23] [24], but prices can lead to improved resource allocations. We referred earlier to screening equilibrium; when the only information provided is "hierarchical," then there is only a distributive effect, and no allocative effect, so it is not surprising that one can obtain Pareto inferior equilibria. If screening produces information about differential comparative advantages, then there is a social value to the information. But the relevant information will not then simply be conveyed by the price. It is not the price information which is critical for improving resource allocations, but information about the relative skills. There are, of course, many situations where price may convey information that is relevant to the efficient allocation of resources.

When individuals have different beliefs and/or degrees of risk aversion, price is obviously relevant for the allocation of shares so as to maximize ex ante expected utility. But if the main reason for trade has to do with differences in beliefs,[25] then there are serious questions about the

---

[23] In much of this paper, I take the standard approach of statistical decision making. More information can be thought of as distinguishing among states of nature that otherwise would be indistinguishable. In the absence of the information, the states of nature are averaged together.

[24] There are a variety of social costs. In the absence of good insurance markets, price volatility can lead to costly consumption variability. Especially in the presence of macro-economic externalities, price volatility may lower welfare. (These are not only theoretical possibilities. Recent research has demonstrated the quantitative significance. See, for example, Guo and Kliesen (2005) who find that oil future price volatility has a negative impact for future GDP growth.); Bellemare, Barrett and Just (2013) use a panel of Ethiopian households data and find that the average household would be willing to pay 6-32 percent of its income to eliminate volatility in the prices of the seven primary food commodities.

[25] There is considerable evidence that much trade has to do with heterogeneous beliefs. See, e.g. Stiglitz (1982). For an early attempt to introduce belief heterogeneity into the analysis of financial markets, see Stiglitz (1972). Since then, there has developed a large literature exploring the consequences. See, e.g. Scheinkman and Xiong (2003) and Wu and Guo (2004), who show that the option to resell assets can induce bubbles in asset prices. In turn, asset bubbles caused by heterogeneous beliefs can induce inefficient (negative sum) overinvestment.

legitimacy of using the ex ante expected utility as an appropriate welfare measure. [26]
Brunnermeier *et al* (2011) propose a more persuasive welfare metric. If one can find a
compensation for each set of beliefs such that prohibiting a particular set of transactions (bets)
and implementing transfers would be Pareto superior, then the bet is belief-neutral inefficient. In
the contexts which they explore in their paper where investment is fixed, they show that
increased betting opportunities is belief-neutral inefficient, in part because it gives rise to
excessive consumption volatility.[27]

 Thus, the real question is, assuming that flash trading improved "price discovery," does the
information produced lead to better resource allocations, e.g. improve the allocation of capital to
one industry or another, to one firm or another? Does knowing information this much faster
really matter for these purposes? If, within the relevant time frame, resource allocations and
other *real* decisions are given, then, as we have noted, price movements reflect little more than a
zero sum game, and if there is a cost to HFT, then it is a negative sum game. They are
redistributive in nature.

Those making real decisions, e.g. about how much to invest in a steel mill, are clearly unlikely to
be affected by these variations in prices within a nanosecond. In that sense, they are
fundamentally irrelevant for real resource allocations. That is why we have argued that the real
focus of HFT is the negative-sum game of trading with a fixed set of assets.

But we have also argued that the adverse welfare consequences are greater, for HFT discourages
the acquisition of information which would make the market more informative *in a relevant
sense*.

Of course, *ex ante* the knowledge that prices after the investment has been made *may* be slightly
better (slightly faster) in reflecting all the relevant information could conceivably affect real
resource allocations, though I have seen no evidence to that effect. [28]

IV. Liquidity When You Need it

The second argument for not restricting markets is that doing so leads to less liquid markets.
More liquid markets make investment more desirable: Those who make investments can exit the

---

(Bolton *et al* 2006, Gilchrist *et al* 2005) While the extent to which these arguments are relevant for HFT may be
debatable, what is clear is that there is no presumption that any induced trading or price discovery is welfare
enhancing. This is particularly relevant for the discussion of derivatives below.

[26] See also, for instance, Gilboa, Samet, and Schmeidler (2004), Hammond (1981) and Harris (1978)

[27] They analyze consumption volatility within the context of a single period model. Guzman and Stiglitz (2014)
establish the increased volatility within a dynamic model. In forthcoming work, they analyze the welfare costs of
this volatility and provide a more welfare criterion that has strong advantages both over that of Brunnermeier *et al*
and over those relying simply on ex ante expected utility. Stiglitz (2013) explains how, in standard macro-
economic models, the increase in consumption volatility can give rise to costly macro-economic volatility.

[28] In fact, from a theoretical perspective, the effect is ambiguous. If there is more price volatility within the
relevant time frame within which the "real" investor contemplates that he might want to sell the asset, then
"better" price discovery could have an adverse effect ex ante on real investment.

9

market, to sell their investments, should they need to do so, quickly with little cost. Hence, the nature of the market after investments have been made can affect the investments that are made.

 But just as we had to look more carefully at the social value of price discovery—and whether any particular "innovation" or set of transactions lead to a more informative price system--so too with liquidity.

The flash crash raised the critical question: the fact that there is more trading at some times does not necessarily mean that there is more liquidity *when it is needed most.*

There are several ways of thinking about liquidity. One is in the context of search: different potential buyers have different evaluations of the given asset, perhaps because they have different prior beliefs about the likelihood of occurrence of different states of nature, perhaps because were they to assume control of the asset, they could put it to different uses. It takes time to find a buyer with a high valuation.[29] If one has to sell an asset quickly, then what one is likely to receive is less than if one could take a longer time.

This is where market makers step in. They perform an important role in arbitrage. They don't in general want to hold the asset for their own account, but they know that by waiting (continuing to search) they can get a higher price. They themselves have enough resources to enable them to be more patient. (Of course, any investor is, in this sense, a potential market maker.) One of the primary determinants in a competitive market of the cost of this market making activity is volatility.

Thick markets in which there is little divergence in beliefs are likely, in these terms, to be liquid. Markets for foreign exchange (at least of the major currencies) are liquid. There is no "private" information that would lead some individuals to be willing to pay more for a dollar (say in terms of a euro) than others. Of course, some might expect the dollar to gain or lose more in value in the coming days, and would therefore like to take a speculative position. But that is not a question of liquidity of the asset: that is a question of the individual investor's ability to obtain money to finance his speculative position.

In this analysis, what matters of course is not the average thickness of the market (or even the average volatility of price) but the value of these variables at the relevant times—when I might want to sell the asset. If, for instance, high frequency trading (or capital market liberalization) leads to more volatility in those circumstances when I might want to sell my assets, then it leads to less liquidity *in the relevant sense.* By the same token, if in such times, the thickness of the market declines because high frequency traders leave the market, the fact that on average markets are thicker is of little relevance.

---

[29] One can also think of the arrival of buyers with different valuations as described by a stochastic process. The longer one waits, the higher the probability that someone will arrive with a high valuation.

There is another sense in which the term liquidity is used. Those who are interested in selling large quantities are also concerned about the thickness of markets: if they are thin, their own actions can cause the price of a stock they are trying to sell to fall. That is why that are interested in the thickness of markets. But if there are "uninformed" traders who can see their actions, and make inferences from those actions about future movements of price, the consequences are much *as if* the market is very thin. (Of course, as we noted earlier, the informed traders will try to make it difficult for the HFT to make inferences; but they inevitably fail to do so perfectly.) That is, they move the market against themselves just as they would were the market far thinner that indicated by the amount of trading.[30]

In the previous section, we argued that high frequency trading can actually lead to a less informative market. So too, it can led to a less liquid market place. One of the things that contributes to the liquidity of the market place are standing orders: individuals who are willing to buy or sell a stock at a given price. There is a certain transactional efficiency: one doesn't have to constantly recalculate. The investor has made an assessment of the fundamental value of the stock, and stands ready to buy it if he can get it at a price sufficiently below that fundamental value to compensate him for the risk. But such positions are based on an understanding that there are not other investors who have access to more timely information about fundamentals. For if that were the case, one would be taken up on the offer when one's offer to buy exceeded the value, or when one's offer to sell fell short. It would be an extreme example of the lemons problem. One would be constantly taken advantage of by more informed investors. These investors understand the lemon's problem, which is why they don't take positions for more than an infinitesimal length of time. But in doing this, they drive home a lesson to all other investors: they shouldn't either. The result is that the markets become less liquid.

V. Concluding comments

The last quarter century has been marked by a high level of financial innovation. But the theory of innovation has emphasized that there can be marked discrepancies between the social and private returns to innovation, and whenever that is the case, innovations may not be welfare enhancing. There can be private returns associated with "stealing" rents from others, or from extending and strengthening market power, or from regulatory arbitrage, circumventing (within the law) regulations intended to reduce externalities and increase the stability of the economy. The analysis runs parallel to that of earlier sections that argued that some of the innovations in financial markets, those that have enabled flash trading, may not have been welfare enhancing.

---

[30] For earlier discussions of adverse selection in this context, see Kyle (1985) and Glosten and Milgrom (1985). More recently, Biais, Foucault and Moinas (2011) find that, because of the adverse selection effects that we have noted, "the equilibrium level of AT exceeds its utilitarian welfare maximizing counterpart".

Derivatives A similar detailed analysis can be conducted for other changes in the market place which have contributed to more active markets. In section II I discussed the liberalization of capital markets, which contributed to more active cross-border capital flows. New markets— new derivatives—have sometimes been defended as helping "complete" the market. But as I comment below, in the theory of the second best, movements towards completing markets, but not going all the way (and we can never go all the way) can lead to Pareto inferior equilibria. Elsewhere, I have shown how such markets can open up new opportunities for gambling between individuals who differ in their ex ante probabilities, leading to significant increases in macroeconomic volatility.[31] [32]

A presumption against the social value of excessive trading. Paul Volcker, among others, has raised questions about whether recent financial innovations have enhanced the performance of the economy. What we can see is (a) growth in the period of financial innovations and liberalization—the period of more active markets-- has been slower than in earlier decades; (b) the economy has experienced the greatest volatility, and the most marked failure—the largest discrepancy between potential and actual output—since the Great Depression; and (c) a disproportionate share of our most talented young people have gone into finance, diverted from other areas (including areas of *real* innovation). These facts put a heavy burden on anyone who wished to argue that these innovations collectively, or any innovation in particular, has contributed to the performance of the economy.

To be sure, advocates of these reforms and "innovations" will argue that, were it not for these reforms and innovations, growth would have been even slower and the economy more unstable: establishing the counterfactual is always difficult.

And, of course, one can construct specific models in which a particular activity has a positive effect—simply by hardwiring the result in assumptions which rule out or minimize the adverse effects.

The analysis of this paper should be seen as increasing the presumption *against* a particular set of innovations and market reforms that have led to enhanced short term trading and cross border capital flows. We have explained why one might expect such activities to be welfare decreasing.

Further costs: Increased short sightedness of markets. There are other costs associated with any change that encourages a focus on the short term: successful growth has to be based on long term investments. Almost by definition, the more attention that gets focused on the short term, and especially the *very* short term, the less attention there is on the long term.

---

[31] While it is not clear how we make welfare judgments in such situations, what it clear is that there can be large costs associated with these macro-economic fluctuations.

[32] There are other societal costs associated with CDS's, evident in the renegotiation of Argentine's debt: vulture funds which owned bonds could bloc a debt restructuring, with perverse incentives in which they would be better off as a result of a failed renegotiation. Other perverse incentive effects from "naked" CDS's have been noted. OTC derivatives have also been used as mechanisms for reducing the overall transparency of markets.

An important strand of modern macroeconomics has centered attention on the limitations of individual's capacities for paying attention. And this is at least equally true of organizations (firms).

We have discussed extensively how these changes can lead to more volatility. Standard economic theory, with risk averse individuals and firms, discusses the high costs of such volatility; and these traditional arguments have been strengthened by the more recent research on macro-externalities, to which I alluded early in the paper. But the limited capacities for attention of individuals and firms implies that there is a further reason that volatility is costly: managing volatility and its consequences diverts managerial attention from other activities, that would have led to faster and more sustainable growth.

Further costs: Market manipulation, front running, and the loss of confidence in markets. [33] There are still other concerns about some financial innovations: they may enhance the power of certain market players to manipulate the market, at least for a while, until the market figures them out. (There were some concerns that this was in fact the case with what were called stub trades.) But even if the distortion in the market is limited, costs can be imposed on others in their attempt to decipher how the market might be manipulated. Again, attention is diverted away from understanding the "fundamentals" of the economy—to acquiring information that might make the economy perform better.

As we briefly noted earlier, there are a variety of ways by which HFT results in sophisticated versions of front running. Co-location, the fact that HFT can pay to get access to business news releases before others, and have been given other advantages has resulted in an unlevel playing field, allowing them to garner rents for themselves at the expense of others. Moreover, as we noted earlier, as confidence in markets erodes, transactions shift out of markets, and the advantages of markets (including their transparency) are lost. [34]

Volatility There is a big debate over whether HFT or the other areas of hyperactive trading (cross border flows, derivatives) results in more or less volatility.[35] As a matter of theory, we have made two observations: First, improved price discovery at a moment of time, by definition, increases price dispersion at that moment. Second, opening up new betting opportunities among those with heterogeneous beliefs results in more consumption volatility, which in turn can lead to more macro-economic volatility.

How do we reconcile these results with the possibility that observed volatility might be unchanged or even lower? First, HFT may only result in discovering information earlier that

---

[33] See Biais and Wooley (2011) for further discussions of manipulation.

[34] In some cases, there may be regulations that protect the market from such manipulation or reduce the prospects of sophisticated front-running.

[35] For example, while Kirilenko, Kyle, and Tuzun (2011) find that "HFTs did not trigger the Flash Crash, but their responses to the unusually large selling pressure on that day exacerbated market volatility". By contrast, Hendershott and Riordan (2009) find no evidence that AT exacerbates volatility when liquidity is low.

otherwise would have been available later. Thus, there is not a fundamental change in the delineation of the states of nature, only a slight change in the timing--an activity which we have argued is of little or negative social value. Secondly, assume that there are two types of traders, those tracking the fundamentals (which move slowly) and noise traders, who are more sensitive to non-fundamental signals. HFT can (as we have noted) help move the market closer to the more stable fundamentals. Moreover, once we take into account the fact that HFT may make the markets *less informative,* it is clearly possible that there is less volatility--but in this case, the reduction in informativeness may again have a social cost.

Policy.

Policy in markets characterized by imperfect and asymmetric information with incomplete risk markets inevitably brings us to a world of the second best. We will never create a market with a complete set of Arrow-Debreu securities; we will never eliminate information asymmetries. There are a host of externalities, by which the actions of one party has effects on others, that cannot be ignored. Even pecuniary externalities matter. In many instances, the worst adverse effects can be mitigated by appropriate regulations. The discussion of the CFTC-SEC Advisory Commission illustrates the complexity of the potential market failures and the regulatory measures that might address these failures.

In this paper, we have identified a number of potentially significant adverse effects of too active markets--whether excess activity takes the form of too frequent trading, trading in too many securities, or too much cross border capital flows. We have questioned the supposed benefits of this excessive financial sector activity. Much of the argumentation of those who advocate unfettered markets relies on focusing on intermediate variables (volume of trade) or concepts alleged (improvements in price discovery) the effects of which on welfare are typically not established. We have suggested, by contrast, that *in the relevant sense,* markets may be neither more informative nor more liquid.

One might well ask: if the social benefits of the activities are limited, might it be easier simply to proscribe the activity itself? But doing so, in a way that did not give rise to other adverse effects, might itself entail considerable complexity.

In some cases (e.g. with excessively rapid trading or cross border capital flows) tax policies can be effective in discouraging these activities. [36]

While there are no easy answers, a plausible case can be made for tapping the brakes: Less active markets can not only be safer markets, they can better serve the societal functions that they are intended to serve.

---

[36] See Stiglitz (1989) and Summers and Summers (1989).

References

Andrea Devenow and Ivo Welch, 1996, "Rational Herding in Financial Economics", *European Economic Review*, Volume 40, Issues 3-5, April 1996, Pages 603-615.

Balnchard, Olivier J., David Romer, Michael Spence, and J. E. Stiglitz (eds.), 2012, *In the Wake of the Crisis,* with Cambridge, MA: MIT Press.

Bellemare, Barrett and Just, 2013, "The Welfare Impacts of Commodity Price Volatility: Evidence from Rural Ethiopia", Am. J. Agr. Econ. (2013) 95 (4):877-899.

Bolton, Patrick, Scheinkman, J., and W. Xiong, 2006, "Executive compensation and short-termist behavior in spculative markets," *Review of Economic Studies,* 73, 577-610.

Bruno Biais and Paul Woolley, 2011, "High Frequency Trading". IDEI working paper.

Brunnermeier, M., Alp Simsek, and Wei Xiong, 2014, "A Welfare Criterion for Models with Distorted Beliefs," Princeton University, March 12

Caprio, Gerard, Patrick Honohan,. and J. E. Stiglitz (eds.), 2001, *Financial Liberalization: How Far, How Fast?* Cambridge, UK: Cambridge University Press

Chaboud, A., E. Hjalmarsson, C. Vega & B. Chiquoine, forthcoming, "Rise of the Machines: Algorithmic Trading in the Foreign Exchange Market". *Journal of Finance*, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1501135

Commission of Experts of the President of the United Nations General Assembly on Reforms of the International Monetary and Financial System, 2010, available as *The Stiglitz Report: Reforming the International Monetary and Financial Systems in the Wake of the Global Crisis,* New York: The New Press.

Demirgüç-Kunt, A., & Detragiache, E., 1998, Financial liberalization and financial fragility. In *Proceedings of Annual Bank Conference on Development Economics,* Washington, DC, 20–21 April

Fitoussi, J., A. Sen and J. E. Stiglitz, 2010, *Mismeasuring Our Lives: Why GDP Doesn't Add Up*, New York: The New Press, 2010.

Furman, Jason, and J. E. Stiglitz, 1999, "Economic Crises: Evidence and Insights from East Asia," *Brookings Papers on Economic Activity*, 1998(2), pp. 1-114. (Presented at Brookings Panel on Economic Activity, Washington, September 3, 1998.)

Geanakoplos, John & Heracles M. Polemarchakis, 1986, "Existence, Regularity, and Constrained Suboptimality of Competitive Allocations When the Asset Market Is Incomplete," In W. Heller, R. Starr, and D. Starrett (eds.), *Essays in Honor of Kenneth Arrow*, Vol. 3. Cambridge University Press, 1986, pp. 65-95.

Gilboa, Itzhak, Dov Samet, and Savid Schmeidler, 2004, Utilitarian aggregation of beliefs and tastes, *Journal of Political Economy,* 112, 932-938

Gilchrist, Simon, Charles Himmelberg, and Gur Huberman, 2005, "Do stock price bubbles influence corporate investment," *Jouranl of Monetary Economics,* 52, 805-827

Glosten, L, and P. Milgrom, 1985, "Bid, ask, and transactions prices in a specialist market with heteroregenously informed agents," *Journal of Financial Economics,* 71-100

Grossman, Sanford J., and Joseph E. Stiglitz, 1980, "On the Impossibility of Informationally Efficient Markets." American Economic Review, 70(3): 393–408

Guo and Kliesen, 2005, "Oil Price Volatility and U.S. Macroeconomic Activity", Federal Reserve Bank of St. Louis Review, November/December 2005 Vol. 87, No. 6, pp. 669-84

Greenwald, Bruce and J. E. Stiglitz, 1986, "Externalities in Economies with Imperfect Information and Incomplete Markets," with B. Greenwald, *Quarterly Journal of Economics*, Vol. 101, No. 2, May 1986, pp. 229-264

Guzman, Martin and J. E. Stiglitz, 2014, "Psuedo-wealth and consumption fluctuations," Columbia Univesity.

Hammond, Peter, 1981, "Ex-ante and ex-post welfare optimality under uncertainty," *Econometrica,* 48, 235-250

Harris, Richard, 1978, Ex post efficiency and resource allocation under uncertainty," *Review of Economic Studies,* 45, 427-436

Harrison, Michael and David Krepts, 1978, "Speculative investor behavior in a stock market with heterogeneous Expectations," *Quarterly Journal of Economics,* 92, 323-336

Hellmann, T.. Murdock, K. and J. E. Stiglitz, 1998, "Financial Restraint and the Market Enhancing View," w in *The Institutional Foundations of East Asian Economic Development*, Y. Hayami and M. Aoki (eds.), London: MacMillan, , pp. 255-284.

Hellmann, T.. Murdock, K. and J. E. Stiglitz, 2000, "Liberalization, Moral Hazard in Banking and Prudential Regulation: Are Capital Requirements Enough?" *American Economic Review*, 90(1), March 2000, pp. 147-165

Hendershott, T., and R. Riordan, 2009, Algorithmic trading and information. NET Institute Working Paper No. 09-08. http://people.stern.nyu.edu/bakos/wise/papers/wise2009-3b2_paper.pdf

Jeanne, O. and Korinek, A., 2011, "Macroprudential regulation versus mopping up after the crash". University of Maryland, working paper.

Jeanne, O. and Korinek, A., 2010, Excessive Volatility in Capital Flows: A Pigouvian Taxation Approach, American Economic Review Papers and Proceedings 100(2), pp. 403-407, May.

Kirilenko, A., A.S. Kyle, M. Samadi & T. Tuzun (2011), "The Flash Crash: The Impact of High Frequency Trading on an Electronic Market" Working paper, MIT http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1686004

Korinek, Anton, 2011a, "The New Economics of Prudential Capital Controls: A Research Agenda", *IMF Economic Review* (2011) 59, 523–561.

Korinek, Anton, 2011b, "Systemic risk-taking: amplification effects, externalities, and regulatory responses," Working Paper Series 1345, European Central Bank.

Korinek, Anton, 2011c , "Hot Money and Serial Financial Crises," IMF Economic Review 59(2), pp. 306-339, June 2011.

Korinek, Anton, 2011d, "Foreign Currency Debt, Risk Premia and Macroeconomic Volatility," *European Economic Review* 55, pp. 371-385, April 2011.

Korinek, Anton, 2011e, Excessive Dollar Borrowing in Emerging Markets: Balance Sheet Effects and Macroeconomic Externalities (updated version of April 2007 paper).

Korinek, Anton, 2012, Capital Flows, Crises and Externalities, Chapter 5 in Allen, Franklin et al., *The Global Macro Economy and Finance: Proceedings of the 16th IEA World Congress*, Volume III, Palgrave Macmillan, Nov. 2012.

Kiyotaki, Nobuhiro & Moore, John, 1997, "Credit Cycles", Journal of Political Economy 105 (2): 211–248.

Kyle, A., 1985, "Continuous auction and insider trading," *Econometrica,* 1315-1335

Lewis, Michael, 2014, *Flash Boys,* New York: W.W. Norton.

Newbery, D. and J. E. Stiglitz, 1984, "Pareto Inferior Trade," *Review of Economic Studies*, 51(1), pp. 1-12.

Patterson, Scott, *Dark Pools: The Rise of the Machine Traders and the Rigging of the U.S. Stock Market,"* 2012 New York: Crown

Radner, R. and J. E. Stiglitz, 1984, "A Nonconcavity in the Value of Information," with R. Radner, in *Bayesian Models in Economic Theory*, Marcel Boyer and Richard Khilstrom (eds.), Elsevier Science Publications, pp. 33-52.

Rodrik, Dani, 2007, "How to Save Globalization from its Cheerleaders," CEPR Discussion Papers 6494, C.E.P.R. Discussion Papers.

Scheinkman, Jose and Wei Xiong, 2003, "Overconfidence and speculative bubbles," *Journal of Political Economy,* 111, 1183-1219.

Shiller, Robert, 1981, "Do Stock Prices Move Too Much to be Justified by Subsequent Changes in Dividends?," *American Economic Review,* American Economic Association, vol. 71(3), pages 421-36, June.

Stiglitz, J., 1972, "Some Aspects of the Pure Theory of Corporate Finance: Bankruptcies and Take-Overs," *Bell Journal of Economics*, 3(2), pp. 458-482.

Stiglitz, J. 1975, "The Theory of Screening, Education and the Distribution of Income," *American Economic Review*, 65(3), June 1975, pp. 283-300.

Stiglitz, J., 1982, "Information and Capital Markets," in *Financial Economics: Essays in Honor of Paul Cootner*, William F.. Reprinted in *The Selected Works of Joseph E. Stiglitz, Volume II: Information and Economic Analysis: Applications to Capital, Labor, and Product Markets*, Oxford: Oxford University Press, 2013, pp. 55-84.

Stiglitz, J., 1984, "Information, Screening and Welfare," in *Bayesian Models in Economic Theory*, Marcel Boyer and Richard Khilstrom (eds.), Elsevier Science Publications, 1984, pp. 209-239.

Stiglitz, J., 1989, "Using Tax Policy to Curb Speculative Short-Term Trading," *Journal of Financial Services Research*, 3(2/3), December 1989, pp. 101-115. Reprinted in *The Selected Works of Joseph E. Stiglitz, Volume II: Information and Economic Analysis: Applications to Capital, Labor, and Product Markets*, Oxford: Oxford University Press, 2013, pp. 85-98.

Stiglitz, J., 1999, "Reforming the Global Economic Architecture: Lessons from Recent Crises." *The Journal of Finance* 54 (4), August 1999, pp. 1508-1521.

Stiglitz, J. 2008, "Capital Market Liberalization, Globalization, and the IMF," in *Capital Market Liberalization and Development*, J.E. Stiglitz and J.A. Ocampo (eds.), New York: Oxford University Press, pp.76-100.

Stiglitz, J., 2013, "Pseudo-Wealth and Macroeconomic Fluctuations," Columbia Unversity working paper.

Stiglitz, J. E., José Antonio Ocampo, Shari Spiegel, Ricardo Ffrench-Davis, and Deepak Nayyar, 2006, *Stability with Growth: Macroeconomics, Liberalization, and Development*, The Initiative for Policy Dialogue Series, Oxford: Oxford University Press

Stiglitz, J. E. and Jose Antonio Ocampo (eds.), 2008, *Capital Market Liberalization and Development,* New York: Oxford University Press

Summers, L., and Victoria Summers, 1989, "When financial markets work too well: A cautious case for a securities transaction tax," *Journal of Financial Services Research*, 3(2/3), December 1989, pp. 261-86.

Turner, Adair, 2010, "Market Efficiency and Rationality: Why Financial Markets are Different," lecture delivered at London School of Economics and Political Science October 12, 2010.

Wu, Ho-Mou and Wen-Chung Gujo, 2004, "Asset price volatility and trading volume with rational beliefs," *Economic Theory,* 23, 795-829.