Why Dealing With Financial Products Is Identical To Gambling

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ABSTRACT

One of the oldest economic wisdom is that demand and supply will predict the (market) price. Diagrams of supply and demand curves show a stable market equilibrium. Unlike almost all other products, financial products are most interesting if the price is rising. It leads to a positively sloped demand curve.

Only from this we can give a mathematical proof that there is no (finite) market equilibrium. Even though one may assume causality and therefore deterministic prices in the unstable regime the underlying mechanism is very complex. Mathematically spoken it is highly nonlinear. As proven earlier market prices are generally non conserved quantities. From this we conclude that price of financial products will fluctuate chaotically in a mathematical sense. Therefore we have a situation identical to gambling.

We conclude with a model of roulette gambling which will create a daily profit of one million dollars for almost a decade. Then it needs a "bailout."

INTRODUCTION

Though trading in financial markets may involve some speculation, it is by and large considered a necessity for a modern economy. It is even thought to be so essential that some banks are considered too big to fail. On the contrary is the image of gambling. It is maybe entertaining, but it is (sometimes) addictive and by and large considered bad. It is considered so bad that it is illegal in many places.

So far for the common believe. Unfortunately it is a fairy tale. We can show that financial trading is identical to gambling. Dziergwa (2013) shows the consequences for the taxation especially the Tobin tax. Here we start our proof by considering supply and demand curves like in Figure 1. If supply is lower than demand, there is a shortage and prices go up. If supply is higher than demand, there is a surplus bringing prices down. This is the main argumentation for a (stable) market price p_m. In contrast financial products are mostly bought, in order to sell them for a higher price. Therefore rising prices make them more attractive. This fundamental difference to ordinary products have also be noted by philosophers, e.g. Schefczyk (2012).

Here we give a rigorous proof that financial products never have a stable market price. Because market prices of financial product are very different from the underlying conserved value (Appel (2011)), their value may fluctuate chaotically in a mathematical sense. Therefore financial trading is as unpredictable as gambling.

In our conclusions we will take this analogy further. By introducing a roulette strategy where one is betting on color and doubling the investment until one wins, we have a perfect model for an investment bank. We even conclude that real gambling would be less risky than financial trading because a global crisis would be impossible.

THE MECHANISM OF MAREKT EQUILIBRIUM

In probably any undergraduate course of economics one will learn about supply and demand. In Figure 1 it is shown that the demand will go down, if the price goes up. On the supply side the supplier is happy to offer more, if the price is high. Mathematically spoken the demand curve (denoted by d in Figure 1) is negatively sloped, and the supply curve (denoted by s in Figure 1) is positively sloped. Therefore they have an intersection. This point defines the market price p_m and the corresponding traded volume v_t.

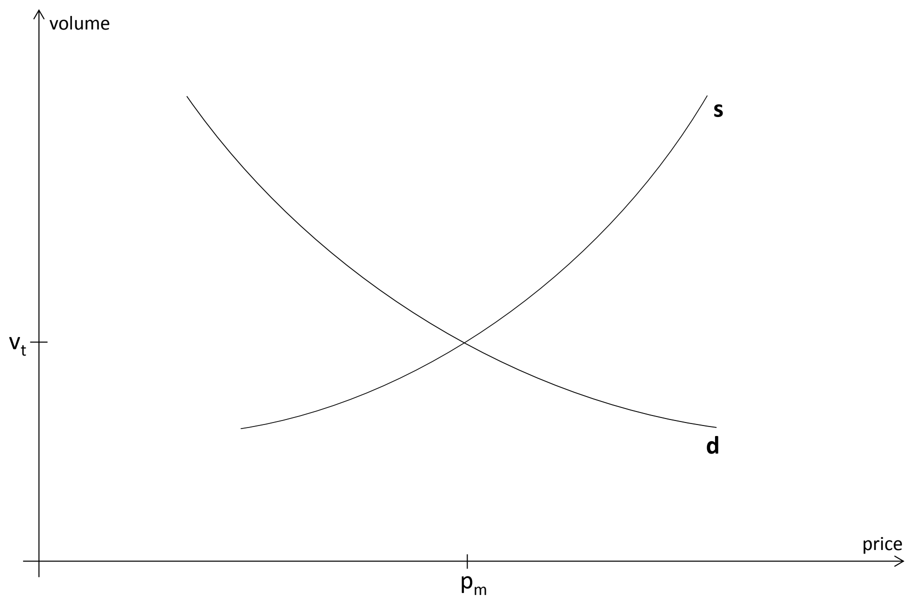

Figure 1: Supply And Demand In Ordinary Markets (Klinkova 2013)

Please note that the curves in Figure 1 do not mean that a certain amount of people are buying or selling at particular prices. At a price p a certain amount of people are willing to sell or buy. The corresponding volume v is the accumulated volume being traded by these people. Of course, if there is a market price, everybody is buying and selling at that price. If the price $p > p_m$ there is much more supply than demand. Therefore the price goes down. If the price $p < p_m$ there is more demand than supply, and the price goes up.

Financial products such as stocks or options have also demand and supply. There is however a difference to almost all other products and services. Most people buy financial products in order to sell them for a higher price. Therefore a rising price is attractive for potential buyers. In other words the demand curve is positively sloped. This difference has been used to explain the momentum effect in stock markets by Appel (2012). Schefczyk (2012) also remarked this problem as the main problem in financial markets. For him it is an explanation for the financial crisis of 2008 (and other crises). While it is obvious that a positively sloped demand curve will not lead to more stability, it is not obvious that it must lead to instability.

To see the point one may consider the curves in Figure 3. Starting with p_1 in Figure 3 there is too little supply or too much demand. Therefore the price will go up to p_2. But the volume v_2 is still too small. So the price will go to p_3 and so forth. It will spiral upward. If one exchanges s- and d-curve in Figure 3 the price will spiral downward. This is a good indicator for chaotic behavior, but it is no proof for instability. Nevertheless there may be points where supply meets demand. It is even quite likely by considering more realistic demand curves. In Figure 3 it is shown that the demand it not ever increasing with rising prices. At some point the price becomes ridiculously high ($p= p_u$). A typical point for a so called maidens' hausse. In the same token at a point $p < p_f$ the price looks like a super sale. (If the price is lower than e.g. book value) With a demand curve of Figure 3 it looks very likely that the supply curve will intersect the demand curve maybe even several times. So we are back to the question whether that market price is stable. In what follows we will prove instability in a mathematically sense.

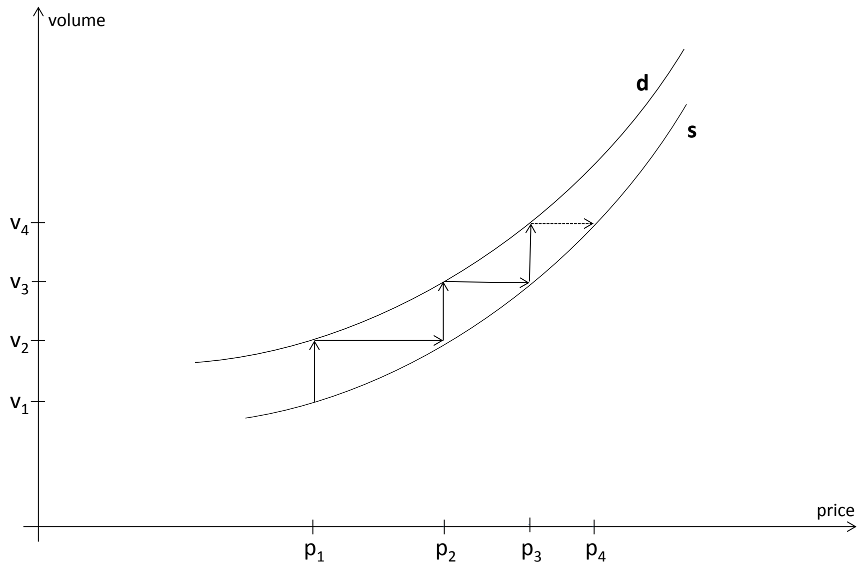

Figure 2: Supply And Demand In A Financial Market, Klinkova (2013)

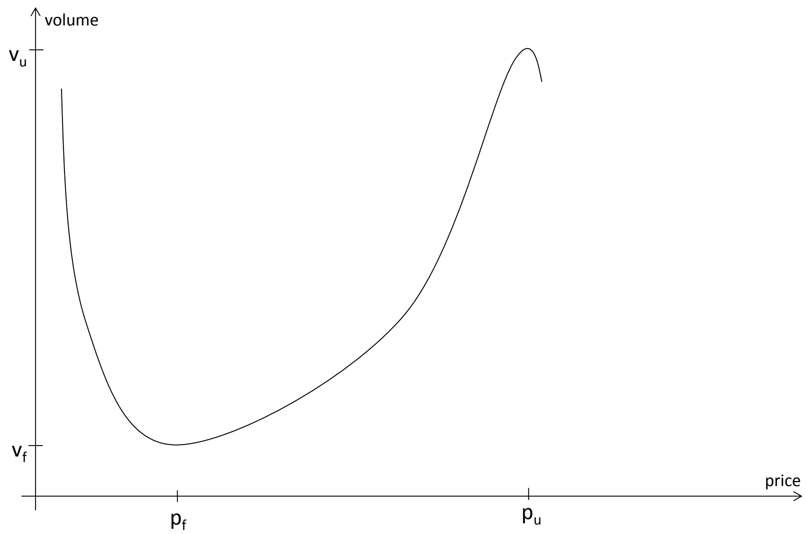

Figure 3: Realistic Demand Curve In Financial Markets, Klinkova (2013)

Please note that the “standard” proof for stability for ordinary markets does not work here. Unfortunately this “standard” proof isn’t common knowledge at all. For more detail please see Klinkova (2013). In any market the buyer will pay the market price p_m if it’s the value is at least slightly higher. (The value is normally not very much higher, because otherwise competition will be high)

$$p_{m0} \lesssim value_0$$

Equation 1: Necessity For Buying

Equation 1 holds for any market transaction. The only specialty for financial markets is that the value is normally not conserved here, cf. Appel (2011). While a conserved value is pretty fixed, a non-conserved one may vary rapidly. The conserved value of e.g. a stock will be proportional to the future earnings a company will make. Though it is not known when buying a stock, it cannot change on a daily basis let alone within milliseconds during high frequency trading. In reality stocks are almost never bought in order to realize the conserved value. Appel (2011) has explicitly shown that the market price of a stock is normally several times higher than its underlying conserved value.

The index naught in Equation 1 denotes an initial equilibrium state. It is of course also valid without the naught. Introducing a small variation δp with $p_m = p_{m0} + \delta p$, inserting it in Equation 1 and making a Taylor expansion to lowest order leads to:

$$p_{m0} + \delta p \lesssim value_0 + \frac{\partial value}{\partial p_m}\Big|_{p_{m0}} \cdot \delta p + O(\delta p^2)$$

Equation 2: Buying condition of equilibrium

The immediate learning from Equation 2 is that if the slope $\partial \mathrm{value}/\partial \mathrm{p_m} > 1$ positive variations in price ($\delta p > 0$) are only possible in the long run. Else the inequality of Equation 2 does not hold. For a slope $\partial \mathrm{value}/\partial \mathrm{p_m} < 1$ the variation in price must be negative for the same reason. This effect can be translated into the timely development of the market price or better traded price. The (non-conserved) value for the buyer does not explicitly depend on time. (Else it would not be possible to choose the starting time as e.g. t = 0) So we have $\mathrm{dvalue/dt} = \partial \mathrm{value}/\partial \mathrm{p_m} \cdot \mathrm{dp_m/dt}$. In other words we have:

$$\frac{\mathrm{dp_m}}{\mathrm{dt}} = \frac{1}{\frac{\partial \mathrm{value}}{\partial \mathrm{p_m}}} \cdot \frac{\mathrm{dvalue}}{\mathrm{dt}}$$

Equation 3: Timely development of market price p_m

Equation 3 is the desired change in market price. Because the value is not conserved it may change any at time and in any direction. If $\partial \mathrm{value}/\partial \mathrm{p_m} > 1$, $\delta p > 0$, and the market price will increase slower (in time) than the value for the buyer. So the buyer has even more reason to buy and will do so. The market price will go to infinity. If $\partial \mathrm{value}/\partial \mathrm{p_m} < 1$, $\delta p < 0$, and the market price will decrease faster than the value for the buyer. So it is allowed for the price to become smaller and smaller. Mathematically spoken it will reach minus infinity.

So we have proven that the market price has no stable equilibrium. It will either go to plus infinity or minus infinity. Of course in reality the market price will bounce between p_f and p_u of Figure 3 rather than $\pm \infty$.

CONCLUSIONS

Market prices in financial markets will either go up or down but will not find market equilibrium. As seen from Figure 3 volume will also go up with price. This is particularly dangerous in the derivatives market. In an ordinary stock market there is a natural cutoff in volume, because the number of stocks is finite (and fix) for a company. Issuing derivatives can be done ad infinitum. It makes the unavoidable crash much more drastic.

While the market price will fluctuate between two extremes, it is far from being predictable. This is because the extreme values denoted by p_f and p_u in Figure 2 are neither fixed nor calculable. Especially the upper bound depends on the moods or better nerves of the individual trader. Therefore Saunders (1993) found so strange relationships for stock prices as the weather on Wall Street. In other words nobody can predict stock prices. So it is possible to make a profit, but nobody can plan to make a profit. By the way, if stock prices were predictable by any scientific method, it would not last long until everybody would use this method. As a result nobody would make a profit. Even in that respect financial trading is identical to gambling. Predicting next week's lottery numbers by whatever method would sooner or later lead to the correct numbers on anybody's lottery ticket. In essence the correct numbers would imply a lower win than the original fee.

Comparing financial trading to gambling or even equating it with it may sound strange for some readers. While financial traders may make a good living over many years, gamblers hardly do. Furthermore profits from financial trading make a substantial part of GDP in some areas. In contrast wins and losses from gambling will make a net loss. However this contradiction is easily solved. In gambling people make a small loss almost all the time. But they have the hope of a rare big win some day. In financial industries it is the other way round. There are some (small) profits over a long time. Then there is a crash or something similar and all profits of the past are destroyed, cf. Dziergwa (2013).In addition profits from other industries and/or consumer's savings may be taken.

There is however a way of gambling pretty similar to financial trading. It is even performed by some people over their entire life without making any losses. It works as follows. At a roulette table one can bet on red or black. So one may bet $ 1 on red. There are two possibilities: Red comes or not. If red comes, one will gain one dollar. If there is black (or zero) one will lose $ 1. Then one has to bet $ 2 on red (or black). Let suppose one will lose again. So the total loss is $ 3. Then one has to bet $ 4 on one color. Let suppose one will win now, one will gain $ 4. Together with the previous loss of $ 3 one will have a net win of $ 1. Obviously in one run one will always win $ 1, as long as one can afford an arbitrary long row of the wrong color. But even in this limit one will not win anything. Performing the mathematics correctly shows an infinite loss in the limit of infinity. Supposedly there is a limit of playing the game for n rounds. (For e.g. n = 10, starting with one dollars would mean taking a maximum bet of $ 512) Then there is a chance of $(19/37)^n$ to lose all the betted money and of course a chance of $1 – (19/37)^n$ to win one dollar. (Please note that we are considering the European instead of the American roulette) The average expected gain is therefore

$$1 - \left(\frac{19}{37}\right)^n - \left(\frac{19}{37}\right)^n \cdot \sum_{i=1}^{n} 2^{i-1} = 1 - \left(\frac{38}{37}\right)^n$$

Equation 4: Net gain in the limit of n capital doublings

As one sees the net gain is always negative. In other words it is a loss. Even or especially in the limit n to infinity it stays negative. It actually goes to $-\infty$. The analogy to the financial industry is even more perfect if one uses proper numbers. Let us suppose a banker/gambler is doing the game above with an initial investment of $ 1 m. He or she will do so every day until he or she wins once. Obviously almost every day this "business" will make a profit of $ 1 m. Let's suppose the credit line is around $ 4 b (limit of rounds n = 12). On average it will need eight years and 54 days until this bubble bursts. Then a bail out of *at most* $ 4.096 b is necessary. Maybe a much smaller amount helps to raise the credit line in order to survive for some other time. And the government may decide, it is worth to save a business that created a profit of one million dollars per day for almost a decade.

One may also create a *big* investment bank from the model above just by doing the betting 100 times in parallel. Obviously this "business" will create a profit of $ 100 m per day, almost double the GDP of Cypress. By doing so at *independent* roulette wheels one just needs a credit line of only $ 400 billion instead of $ 4 trillion. Please note that this kind of *economies of scale* is not possible in the real financial industries. Their roulette wheels (= markets) are not independent. They would need a credit line of $ 4 trillion. So we close with the sad conclusion that financial trading is not only identical to gambling. Real gambling would be less risky because there would be no global, simultaneous crisis.

Doing this organized gambling in reality would lead to big losses for the casinos. In order to survive they were forced to lower the quotas for ordinary hobby gamblers, say by giving 30 instead of 35 times the original bet if the number on the roulette table is right. Again this is completely analogous to banking where the individual customers pay for the game of the big wigs.

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