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## **INFLATION IN A VIRTUAL ECONOMY – A REAL OR VIRTUAL THREAT?**

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**Summary:** The aim of the paper is an analysis of the way and circumstances under which inflation can occur in a virtual economy. It is also an attempt to answer the question whether, and in what way virtual inflation may be related to inflation in the real economy. The article is conceptual, because in the present state of statistical data the effects of virtual economies are not carried out, or are generated in a very small number, which makes it impossible to make reliable calculations.

**Keywords:** inflation, virtual economy, virtual money.

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### **1. Introduction**

Inflation is a phenomenon inherent to the real economy. Facing the increasing activity of people in virtual worlds, raises the question of whether virtual economies are threatened by the occurrence of this phenomenon. Furthermore, if virtual inflation really appears, does it influence the real economy? Are the mechanisms of generating inflation identical in the real and virtual economy? How to combat this phenomenon in virtual reality? This article attempts to answer these questions.

The hypothesis of the paper is that virtual inflation influences both the virtual and real economy, but in different ways. Unfortunately, the article is still conceptual, because in the present state of statistical data the effects of virtual economies are not carried out, or are generated in a very small number, which makes it impossible to make reliable calculations.

According to economic theory, it is said that inflation is a continual increase in the general price level, which affects individuals, businesses, and the government [Mishkin 2007, p. 10]. This means that inflation is a dynamic macroeconomical phenomenon as it relates to the prices of all goods produced in the economy. There are different mechanisms of inflation forming. Due to its cause it is pointed out that inflation can be brought about by costs, demand or supply side. Cost inflation occurs

when rising production costs are independent of the aggregated demand for goods. Demand inflation occurs when the aggregated demand is higher than the possibility of its fulfillment. Supply (monetary) inflation occurs when the amount of money in circulation is increased.

These theories were formed and verified in real economies. Moreover, it should be noted that they are related to market economies in which the free market mechanism works. These theories do not work in regulated economies, because prices are set administratively in them. This means that inflation is a phenomenon that may be centrally controlled and reach a level that, for various reasons, is desirable at that moment. It may also have a value of zero, when in the long run prices are administratively maintained at a constant level. Deflation is the opposite phenomenon to inflation. This means a decline in the general price level. Inflation is typical for modern economies, although in times of crisis price declines are observed which in some cases<sup>1</sup> can lead to deflation.

## 2. What is a virtual economy?<sup>2</sup>

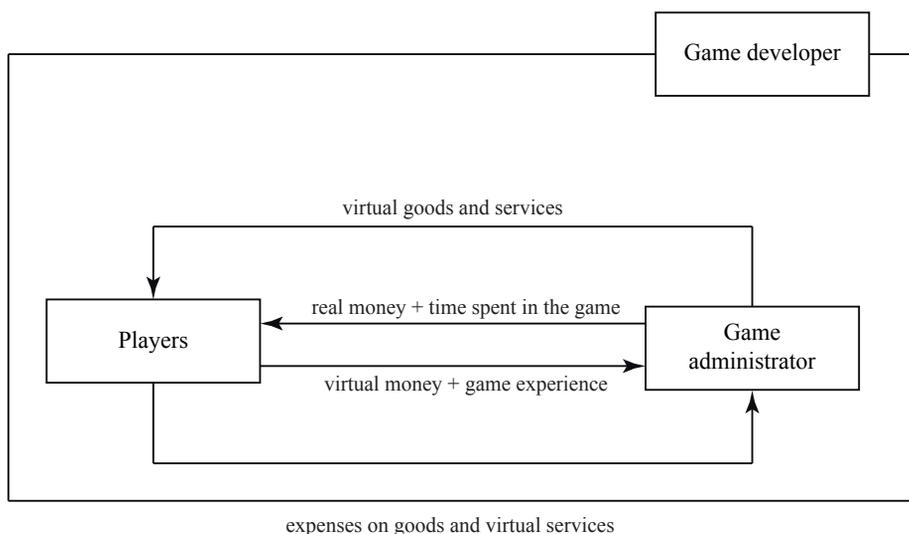
By virtual economy one means a virtual space, working as a world in which individual players (participants in the game) realize scenarios implemented by the creator of the virtual world. E. Castronova defines a virtual economy as artificial economies inside online games, especially when the artificially scarce goods and currencies of those economies were traded for real money [Castronova 2006, pp. 814-863]. According to V. Lehdonvirta and M. Ernkvist, a virtual economy is specific because it centers around commodities that are digital, demand arises from the increasing use of digital services in business and leisure, and supply is created through the expenditure of human effort, and in doing so requires relatively few specialized skills and resources [Lehdonvirta, Ernkvist 2011, p. 6].

The main regulator of the virtual world is the creator of the game (the architect of the virtual world). This is understood as an entity that initiates the creation of the virtual world and who hold a full copyright to the virtual world. The manager of the game is understood as someone separated from the structure of the game's organizational unit or an independent entity (outsourcing) dealing with the technical supervision over the operation of the virtual world and the implementation of the solutions generated by the architect of the game. The manager of the game also plays the role of a judicial body (the last instance) and the Orderer, that are entitled to elect from the participants of the virtual world (players) local law enforcement officials (local administrators). Such a view of the virtual world allows to look at the relationships between actors in a virtual world just like the relationships within the entities in real economy terms.

<sup>1</sup> For example in 2010 for Ireland CPI was 99.1, Japan – 99.3, Latvia – 98.9 [Rocznik Statystyczny RP 2012, p. 796].

<sup>2</sup> Based on [Maciejasz-Świątkiewicz, Musiał 2013, pp. 64-71].

A virtual economy and the money circulation within it can be analyzed from two perspectives: internal and external. According to the first approach, analysis is limited to the virtual world which is created by the terms and conditions prevailing in the game. In such a system, the virtual economy is a sample of a closed economy with the participation of the state. The role of the state is played by the creator of the game (the architect of the virtual world), who is setting the rules of the individual players activity and the entire universe. In the latter case, the virtual economy is analyzed in conjunction with the real economy, which is treated similarly to foreign countries with which the commodity-monetary exchange happens. A virtual economy should be treated rather as a centrally controlled economy with elements of a market economy than a fully-free market economy, because individual entities do not have full freedom in conducting business. It works within the framework set by the creator of the game. A greater freedom is connected with choosing the type and scope of the activities undertaken within the framework of the game. However, this is limited by the scenarios established by the architect of the virtual world. The scheme of the flow of income built up in the virtual world in the first variant is shown in Figure 1, while the second – in Figure 2.



**Fig. 1.** Commodity-monetary turnover of internal virtual economy

Source: [Maciejasz-Świątkiewicz, Musiał 2013, p. 65].

In analogy to the scheme of the functioning of a closed economy without the participation of the state, where households through the provision of services of production factors receive income and contribute to the creation of goods and services offered by enterprises, game players directly and indirectly affect the supply of goods

and services within a virtual world. However, there is a difference in the way they are produced. Real goods are the result of consuming limited resources, while virtual goods are available in advance (there is no potential production) for each player, but the possibility of obtaining them depends on the fulfillment of certain conditions. Most often hist is connected with getting a certain number of experience points or possessing a certain amount of virtual currency. The amount of virtual currency is dependent on two factors: the success in the game (the unit of currency is a form of compensation for the realization of a specific scenario) or the transfer of real money that is turned into virtual money according to the exchange rate set by the creator of the game in a process supervised by the manager of the game. The second method of increasing the resources of virtual currency is faster than the first and does not require such a large amount of time spent in the game. The only limitation is the number of real money units that are currently owned by the player.

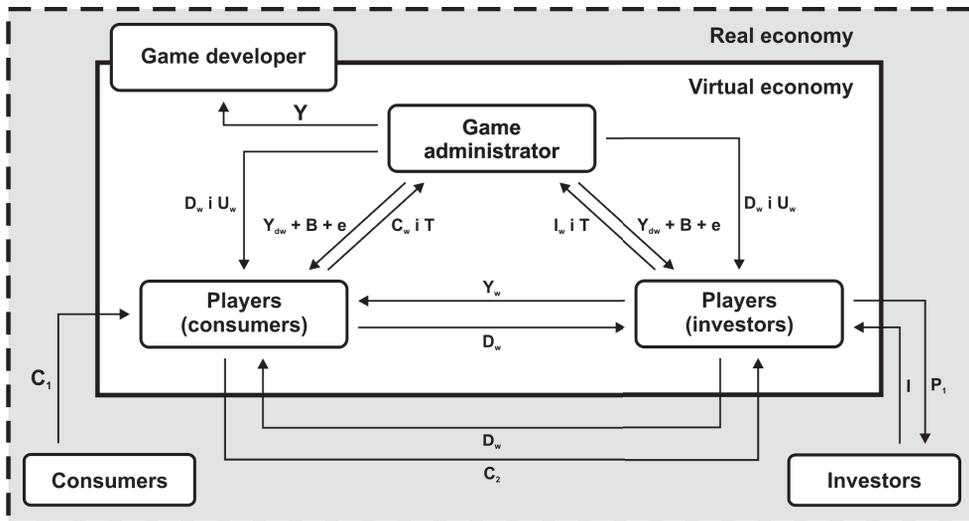


Fig. 2. Commodity-monetary turnover of an external virtual economy

Source: [Maciejasz-Świątkiewicz, Musiał 2013, p. 67].

Abbreviations in the figure are as follows:  $C_1$  – consumption expenditure incurred by the player with connection to the accession to the virtual world,  $C_2$  – consumption expenditure on virtual goods carried out within the real economy,  $C_w$  – consumption expenditure on virtual goods purchased in the virtual world,  $I$  – investment expenditure incurred by the players – investors (in real money),  $I_w$  – acquisition of virtual goods treated as a form of capital investment,  $T$  – fees connected with participation in the game (virtual taxes),  $B$  – bonuses awarded during the game,  $e$  – experience points obtained in the game,  $D_w$  – virtual goods,  $U_w$  – virtual services,

$Y_{dw}$  – virtual disposable income,  $Y$  – income of the real economy,  $P_2$  – real income of player–investor.

In the second model of a virtual economy there are two types of participants: players–consumers and players–investors. The basis for this distinction is the motivation of accession to the virtual world. For the players – consumers it is only consumer willingness to participate in the game, while in case of players – investors, it is the desire to obtain benefits from such participation. Players – investors can be both individual entities as well as companies and institutions. An example of a government’s negative involvement in virtual worlds is forcing Chinese prisoners to several hours of the game in order to obtain virtual items, which are then resold for real money [Vincent 2013].

In any type of virtual economy there is the possibility of the existence of an informal economy, which is manifested when the players abuse the mechanisms of participation in the game. This happens when they use hacking programs, thanks to which they can increase their funds without any reference to the activity taken in the game. As a result of this activity the actual riches (virtual goods and funds) are greater than those recorded by the manager of the game. Moreover, a shadow economy includes all the players’ actions that are inconsistent with the principles implemented by the creator of the virtual world, especially due to the sale of the collected virtual goods, access to an account or the trade of virtual money outside the virtual world. According to widely accepted rules commodity-money trade must remain under the control of the manager of the game. Any deviations from this rule are the most common types of abuse of the rules of the game. In the case of acts of sales, a player may be misled, for example, to obtain confidential information about credit card numbers. Because it is the most popular method of making payments for virtual goods, there is a very high risk of stealing such data. Therefore, as well as the loss of profits of the manager of the game, the players can lose their real money.

When analyzing a virtual economy combined with a real economy, it is also important to define the mechanisms permeation between virtual money and the real world. This can be done by the transformation of initiating payments, subscription fees or real money for a virtual good or virtual money, which is then sold at a profit outside the world of the game for real money. This works in a similar manner to the operation of export (Ex) and import (Im) in the real world. Exports take place when a player makes the transfer of virtual goods outside of the virtual world and sells them for real money. Imports take place when the goods or services derived from real-world payments are made in virtual money. While the occurrence of exports seems to be quite common in virtual economies, imports seem to be a much rarer. This means that the balance of exchange between a virtual economy and a real economy will be generally positive, which means that a greater amount of money will supply the virtual economy.

### 3. The phenomenon of inflation in virtual worlds

The functioning of a virtual economy bears the marks of a regulated economy. In internal terms it can be concluded that inflation will also be internal, limited only to the world of the game. This may be demand-induced inflation, which appears when there are additional players in the game, and for technical reasons it is not possible to guarantee an additional amount of virtual goods (artifacts), so the producer of the game can increase their price. It may also take the form of cost inflation as an increase in operating costs related to the virtual world, regardless of the current number of players. However, their number to some extent can determine the appearance of additional costs.

While analyzing the operation of the virtual economy, it should be noted that this bears the hallmarks of a regulated economy. In internal terms it can be said that inflation is also internal, limited only to the world of the game. This may be demand-induced inflation, when in the game some additional players appear and for technical reasons it is not possible to guarantee an additional amount of virtual goods (artifacts), the producer of the game can increase their price. In internal terms, cost inflation could also appear which is related to the costs incurred by administrators and game manufacturers no matter how many players are in the game.

In internal terms, supply-induced inflation will occur due to the mechanism of the functioning of virtual worlds. The reason for this is hidden in how individual players function inside a virtual world. A closer look at the relationships in virtual worlds leads to the conclusion that the activity of players focused on two main areas: increasing the level of experience and/or consuming virtual goods. These areas penetrate each other, causing a number of feedback loops. On the one hand, getting new points of experience helps to raise the rank of the player (a measure of status in the game), which then allows him/her to purchase items not yet available. On the other hand, the rate of player advancement is also dependent on the attributes of the objects currently in his/her possession. Assuming the possibility of specialization, an exchange of virtual goods (sometimes virtual services) will happen. Specialization of a player can be defined as developing a certain skill (ability) at a level that allows to obtain additional benefits as a result of this fact. For example, players specialized in obtaining a particular virtual resource (i.e. wood, stone, metal ores) may begin to offer them to other players, due to the fact that their acquisition is easier for them (cheaper - requires less time sacrifice or virtual resources) than for other players who would have to achieve at least the same level of skills. Accordingly, the purchase of goods from other players appears to be a more rational way of obtaining the desired resource (goods) than the separate preparation on a lower level of skill. In the context of the virtual world we can observe specialized markets based on the laws of supply and demand. This fact largely determines the rise of supply-induced inflation since, assuming the limitlessness of resources and the sustained inflow of new players, the

supply of virtual goods will rise in response to the reported demand, especially from new players<sup>3</sup>.

Another important issue in terms of the supply in virtual worlds is the issue of money emissions mechanism inside the virtual world. At this point we should make the distinction between virtual currency, which occurs within the virtual world in connection with the transformation of real money and currency acquired from doing tasks provided by the game. While in the case of virtual currency, control by the game creator seems to be total, it should be noted that through the illegal behavior of players it can be disrupted, whereas in the case of a currency representing the equivalent of the success of players in the game control is very limited. This is due to the fact that each player has to be able to participate in a virtual world, and must have the opportunity to purchase certain goods and virtual services. Such an opportunity is given precisely by doing certain tasks for which he/she receives remuneration. This revenue is then spent on virtual consumption. Thus, with the assumption of a constant inflow of new players to the virtual world, the supply of standard virtual currency will keep growing. In addition, offering currency in exchange for real money leads to a situation where, in the virtual world at least two types of currency operate, i.e. standard currency (plus experience points) and virtual currency (the result of the conversion of real money into virtual money). The level of wealth held by the individual players will vary due to the moment of accession to the game, success in the game, the possibility of converting real money into virtual money and the level of specialization. No possibility of issuing larger amounts of virtual money will start the process of increasing the prices of virtual goods. Moreover, new players will find that the best way to get rich quick is to strive for specialization, which further enhances the inflation effects. An example of a virtual world struggling with the problem of inflation is the Diablo universe. Although released in May 2012, the third edition of this classic game dealt better with the problems of inflation but in fact, it was shown that the bad anti-inflation policy made by the architect of the game can in the long run lead to a decline in confidence in the virtual currency or to rejecting it completely, as was in the case of Diablo 2.

Anti-inflation policy in virtual worlds is primarily based on the control of currency inflows to the world (faucets) and outflows, which can be defined as discharge points of virtual currency (money sinks). Inflows of virtual currency mainly comprise of primary player activity expressed in finishing tasks or taking advantage of alliances made with other players in order to pursue more lucrative tasks or earning an income from trading virtual goods. Outflows are points under which a part of the virtual currency is removed from the virtual world, such as: repair of equipment, purchase of a new one in the case of inability to repair, purchase of additional equipment. Control of outflows from the point of view of anti-inflationary actions seems to be the most effective because through regulations of prices offered directly by the

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<sup>3</sup> See also [*Monetary Inflation...* 2013].

creator himself, he/she can collect a surplus of virtual money which is the result of the actions in the game. The effectiveness of this kind of action is reduced significantly when the players can trade with each other using virtual currency. In this case, the currency does not disappear from the world of the game, but passes into the possession of another player, increasing the level of his/her wealth.

Another instrument of monetary control is the restart of the virtual statistics connected with the amount of virtual money, although this type of instrument is not desired by the participants in virtual worlds and in the long term is also not very effective. It merely removes the effect of inflation, not the cause, which is a malfunctioning relationship between the inflows and outflows of virtual money.

When analysing the virtual economy in external terms, additional circumstances can appear that might trigger inflation. In particular, demand-induced inflation can be higher if the interest in virtual goods in the real market is bigger, which can be legally offered outside the virtual economy. In most games this is not possible, but in theory one can imagine a situation where the demand for virtual goods is much larger than the number of those goods entered for the game. Then excess demand appears, which drives inflation. However this type of inflation will not be formally recorded as transactions involving virtual goods which are usually made in the grey economy of real market. Meanwhile, the game's good price will not change.

In the context of this article it is also important to consider the question if the virtual inflation can penetrate the real world? The answer to such a question is currently very difficult. Because of the lack of statistical data which honestly describe virtual worlds, especially in the field of virtual monetary systems, they are largely inaccessible and the companies creating virtual worlds are not interested in sharing them. However, it seems that the threat of virtual worlds considered as a negative influence on the inflation in the real world can be realized only when the reverse conversion of virtual money into real money will be possible. Then, virtual worlds should be treated as a source of money creation working very similarly to the system of commercial banks. It is also necessary to identify the channels of such a conversion, or would it be made through legal channels and therefore it could be the subject of the control of the central bank, or by illegal activities where such control would be much more difficult, and in many cases impossible.

#### **4. Conclusions**

Creating games which allow for the participation of many players in real time in worlds that function under regulations and principles copied from the real world, allowed the development of a new part of the economy – a virtual economy. The desire to improve the attractiveness of the game has also created a digital space, which can become the basis for the development of virtual economics. In contrast to the games offering only a simulation of economic conditions where influence is limited to a single player's choice, in the case of extended virtual worlds a player

behavior has caused the creation of a huge internal market, which operates on similar principles to the economy in realistic conditions. An indispensable element of virtual worlds is virtual money, whose role from the point of view of the world (the fusion) and the same author (income), is one of its key elements. A virtual economy, however, despite some similarities to the real economy, does not allow the use of simple transfers to the analysis of economic phenomena. Inflation is a good example of this phenomenon. Problems in the optimal adjustment in the amount of virtual goods and services in relation to the virtual quantity of virtual money can favor inflation. However, notwithstanding the similarities to the real economy, its course may vary significantly from what can be observed in the real world. It should be noted that there are some circumstances in which virtual inflation can become part of real inflation. However, the current state of the legal framework for the operation of virtual worlds and the reluctance of developers to allow virtual goods' trading outside the game world makes the risk small. However, it is necessary to constantly monitor the development of virtual worlds, as the multitude of economic phenomena and the involvement of a large amount of real money in the future may be a significant economic problem.

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## **INFLACJA W WIRTUALNEJ GOSPODARCE – REALNE CZY WIRTUALNE ZAGROŻENIE?**

**Streszczenie:** Niniejszy artykuł stanowi próbę analizy tego, w jaki sposób i w jakich okolicznościach w wirtualnej gospodarce może się pojawić inflacja. Stanowi on również próbę odpowiedzi na pytanie, czy i w jaki sposób wirtualna inflacja może mieć związek z inflacją rejestrowaną w gospodarce rzeczywistej. Artykuł ma charakter koncepcyjny, ponieważ przy aktualnym stanie danych statystycznych pomiar efektów działania wirtualnych gospodarek nie jest prowadzony lub jest prowadzony w znikomym stopniu, co uniemożliwia dokonanie wiarygodnych obliczeń.

**Słowa kluczowe:** inflacja, wirtualna gospodarka, wirtualny pieniądz.