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Real Money and Economic Growth

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Abstract

People recognized the important role played by money in the economy a long time ago. However, it was only approximately 50 years ago that Milton Friedman convincingly proved that change in the quantity of money in the economy might have a very serious effect on the GDP.

This paper reveals a most intimate non-linear linkage between growth of real GDP and growth of real money supply using the example of a number of countries and unions (Russia, Japan, Brazil and Eurozone). It is shown that exponential growth of real money supply corresponds to linear growth of real GDP.

Hypotheses are advanced which explain such a nature of the inter-linkage. A number of practical recommendations are given which pertain, first of all, to monetary policy.

Key words: GDP, economic growth, money supply, monetary policy, Central Banks

JEL Classification: E41, E50, E51, E52, E58, O11, O23, O42

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Influence of Monetary Forces on the Economy

The role of money in the economy has been the focus of economists for a long time. The importance of money inflow into the country was underlined as early as the time of the representatives of the so-called economic school of mercantilism. Thus, **Serra** (1613), for example, stresses how important it is for the «state to have gold and silver in abundance both for peoples and monarchs what benefits it gives». In the late 19-th and in the early 20-th centuries, the quantitative theory of money came to prominence a hefty

contribution to which was made, particularly, by such an eminent economist as **Irving Fisher** (1867-1947).

However, the real disruptive breakthrough in establishing the mutual linkage between economic growth and money was the publication of the book «A Monetary History of the United States, 1867-1960» by Milton **Friedman** and **Anna Schwartz** (Friedman, Schwartz, 1963). In this truly epoch-making book, adducing convincing examples, they showed how multiple crises in the history of the USA (including the Great Depression) had been caused by contraction of money supply. As it was later summed up by Bernanke (2004), «*Friedman and Schwartz offered important new evidence and arguments about the role of monetary factors in the Great Depression. In contradiction to the prevalent view of the time, that money and monetary policy played at most a purely passive role in the Depression, Friedman and Schwartz argued that "the [economic] contraction is in fact a tragic testimonial to the importance of monetary forces"*»

Reduction in money supply leads to recession – this finding became the reason and a point of departure for multiple subsequent studies.

One of the doubts voiced by economists concerning Friedman's ideas was the uncertainty surrounding the question of which was the indicator of influence and which was the result. In other words, contraction in money supply causes the economy to shrink, or, on the contrary, the shrinking economy requires less money and, as a result, money supply declines. «To put it in simpler terms: we know that the economy and money supply contracted rapidly in the early 1930-s, but was it the «money dog» that wagged the «economic tail» or vice versa? » ([Bernanke, 2004](#)).

To prove that it is the money supply that influences the GDP, research has been undertaken along several lines:

Firstly, special characteristic episodes from the economic history of the USA were identified. During these special events, the decisions made by the FRS resulting in contraction in money supply were not dictated by the state of the US economy, but under the influence of the external international situation or due to the economic authorities' commitment to certain beliefs. In other words, the FRS did have an opportunity of avoiding contraction in money supply, but it, during these episodes, did not seize upon them. And as a result of each of such episodes, the economy was given a negative impetus. ([Bernanke, 2004](#), [Blinov, 2014](#)).

Secondly, broad international comparisons were made as a result of which it turned out that the «contagion vector» of the crisis was the so called «gold standard». The thing was that the countries that had declared they were on gold standard, pledged to exchange their paper money for gold with a ratio established at the legislative level. For that purpose, an appropriate gold reserve was required to be kept.

The «contagion» mechanism was as follows: when certain countries (let us call them «recipients» of gold) for various reasons raised the rates and gold began to flow into them from other countries with low rates (let us call them «donors» of gold). The gold reserves of the donor countries (countries with low rates) began to diminish. To protect themselves against this «leakage» of gold, they also raised their rates though such countries' economies did not require at all such a toughening of the monetary policy. Sometimes, on the contrary, the economy cried out for a softening of the monetary policy in view of a threat of recession. This «undesirable» hike in the rates caused money supply to shrink, as it made worse the terms and conditions for provision of credit facilities both for enterprises and households, hampered refinancing of the debts, resulted in bankruptcies, etc. While the shrinking money supply led to contraction in demand and a decline in the output.

Research (undertaken by Choudhri and Kochin, 1980; Eichengreen and Sachs, 1985) made it abundantly clear that such a mechanism was in place ([Bernanke, 2004](#)). The earlier the country abandoned the «gold standard», the sooner economic recovery set in. While a number of countries, where gold was not the basis of the currency system (for example, China, where the «silver» standard was in operation) were able to avoid recession altogether. To complete the picture, we shall add that the Soviet Union also avoided recession as it was not bound up with the «gold standard» – the economy of the USSR during the years of the Great Depression was booming. Therefore, convincing proof was obtained to confirm that contracting money supply was the cause of economic crises, it had a negative effect on the economic growth.

However, the stimulating impact of money supply growth on the economic growth had not appeared to be so evident for quite a while. And to blame for it was such a well-known phenomenon as inflation. There are multiple examples to show that rapid money supply growth only caused prices to shoot up (inflation), whereas economy did not only grow but it even contracted. One of such episodes happened in Russia during 1992-1995. The nominal money supply, during those 4 years, had grown 245 times (from 0.9 to 220.8 trln.Rbls),² whereas the real GDP, for the same period, had not grown, it had decreased by 42.4%. It was not for nothing that Milton Friedman considered inflation to be «absolute evil», - in many cases it did not contribute to economic growth.

This is precisely why *'The attempt to use monetary policy to extricate an economy from a deep depression was often compared to "pushing on a string"'* ([Bernanke, 2004](#)). The flexible leash is known to allow the dog to be slowed down but it does not allow the dog to be pushed. This is exactly how, in the opinion of some Russian economists (see, for example, [Sonin, 2013](#)), the monetary and credit policy operates – reduction in money causes recession,

² Source: Central Bank of the Russian Federation. In current (non-denominated) Rubles. In 1998, denomination was carried through. Subject to that money supply grew from 0.9 to 220.8 bn. denominated Rubles.

but it is alleged to be impossible to facilitate economic growth by boosting money supply.

However, despite the vividness of the “dog leash” metaphor, it is erroneous. The master, using the leash, can both take the dog into the public garden and take it out of the public garden. It is just that for that purpose the master has to lead the dog, to be in front of it, if necessary.

It may happen infrequently but in the history of many countries one can come across the episodes when the economy was growing even against the background of very high inflation (more than 40% a year). This, for example, happened in Brazil (1984-1987), Vietnam (1987-1991). A similar episode did indeed occur in the economic history of Russia, too. Thus, for instance, in 1999, when inflation peaked in annualized terms at 120% (price increased 2.2 times), the GDP grew by 6.4%. In all these cases, soft monetary policy was conducted and the money supply growth rates were higher than price rises.

Inflation seems to interfere with evaluation of the influence that the quantity of money exerts on the economy. Fortunately, there is a way, which allows this to be done even despite significant changes in price levels. The American economist **Don Patinkin** (1922-1995) in his works showed that in the economic analysis it was not only the goods prices that mattered, but also the price of money in relation to goods supply. In other words, one has to take into account real purchasing power of money.

Thus, if the prices for all the goods have fallen down, say, by 10%, and the money supply in the *nominal* terms remains unchanged despite that, that means that in *real* terms money supply has grown by 11.1%, because the real purchasing power of money has grown. And, vice versa, if the prices grew by 10%, that means that (nominally unchanged) money supply in real terms has contracted approximately by 9%.

Patinkin’s ideas allow one to investigate the linkage between the GDP and money supply even despite inflation. It is just that in order to assess the trend development of money supply one has to apply the same approach which is used to assess the GDP. As statistics and most studies feature real GDP indicators. ***Just the same way one needs to use in statistics and in studies real indicators of money supply.***

And then the picture becomes much more understandable. Above we described an episode where, for four years in Russia (1992-1995 inclusive), money supply nominally increased 245 times, whilst the GDP decreased by more than 40% at the same time. One would think that the linkage established by Friedman and his followers between the quantity of money and the state of economy does not seem to be corroborated.

But everything seems to fit into their places once we pass over to real values. If you consider inflation (hereinafter consumer price index, CPI, is used), then real money supply during these four years decreased 8 (!) times, or by 87.5%.

And against the backdrop of such monetary contraction, it is not surprising at all that the GDP almost halved. Everything is exactly the way as Friedman talks about, if one talks about real (rather than nominal) values. **Real monetary contraction brings about real decline in the GDP.**

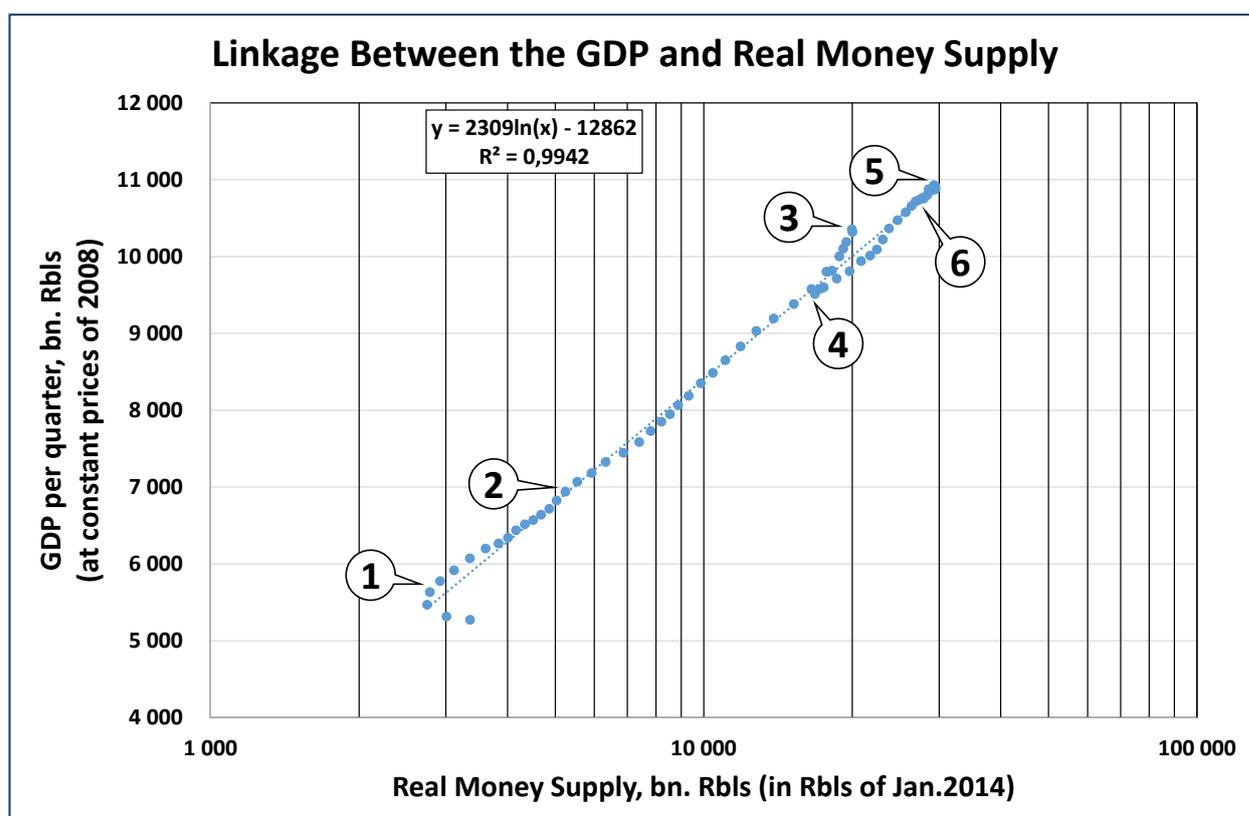
Linkage between Real Money Supply and the GDP

If we are to recognize the changes in real money supply to be the cause of changes in the real GDP, then there must be observed a close inter-relationship between these indicators. Below we shall research the linkage between money supply³ and the GDP in a number of countries. While in order to avoid the effect of inflation, we shall use real money supply⁴ for those countries where inflation was significant.

Russia

Let us start off with Russia. In the earlier article "How To Double Russia's GDP" ([Blinov, 2015](#)), the results of comparison between the real money supply and Russia's GDP were already published. In **figure 1** this linkage is given in graphic form.

Figure 1. Linkage between the GDP and real money supply in Russia throughout more than 15 years (1999-2015) has been very stable.



Source: "How to Double Russia's GDP" ([Blinov, 2015](#)). The real money supply in this graph is plotted on the log scale.

³ Aggregate M2

⁴ To calculate real money supply, consumer price index was used (CPI)

The real money supply in this graph is plotted on the log scale. That means that linear growth of real GDP corresponds to exponential growth of the real money supply, which is also confirmed by the equation in the diagram. We shall then see that this correlation is true of other countries and we shall try to find an explanation for this.

Throughout the 15 years shown in the figure, Russia's GDP has almost doubled, from point 1 to point 5 in the diagram. Therefore, a question comes up: is the same dependency true of the time when the GDP drops down?

This confirmation can be obtained directly from figure 1. During the period under consideration there have been two recessions in Russia – one was linked with the 2008 crisis. The second one is the current (2015) crisis.

The first episode of money contraction was observed between the 4-th quarter of 2008 (point 3) and the 4-th quarter of 2009 (point 4): the real money supply in Russia was on the decline. In the meantime, there was a drop in the GDP, that is to say, the linkage between the GDP and the real money supply was maintained.

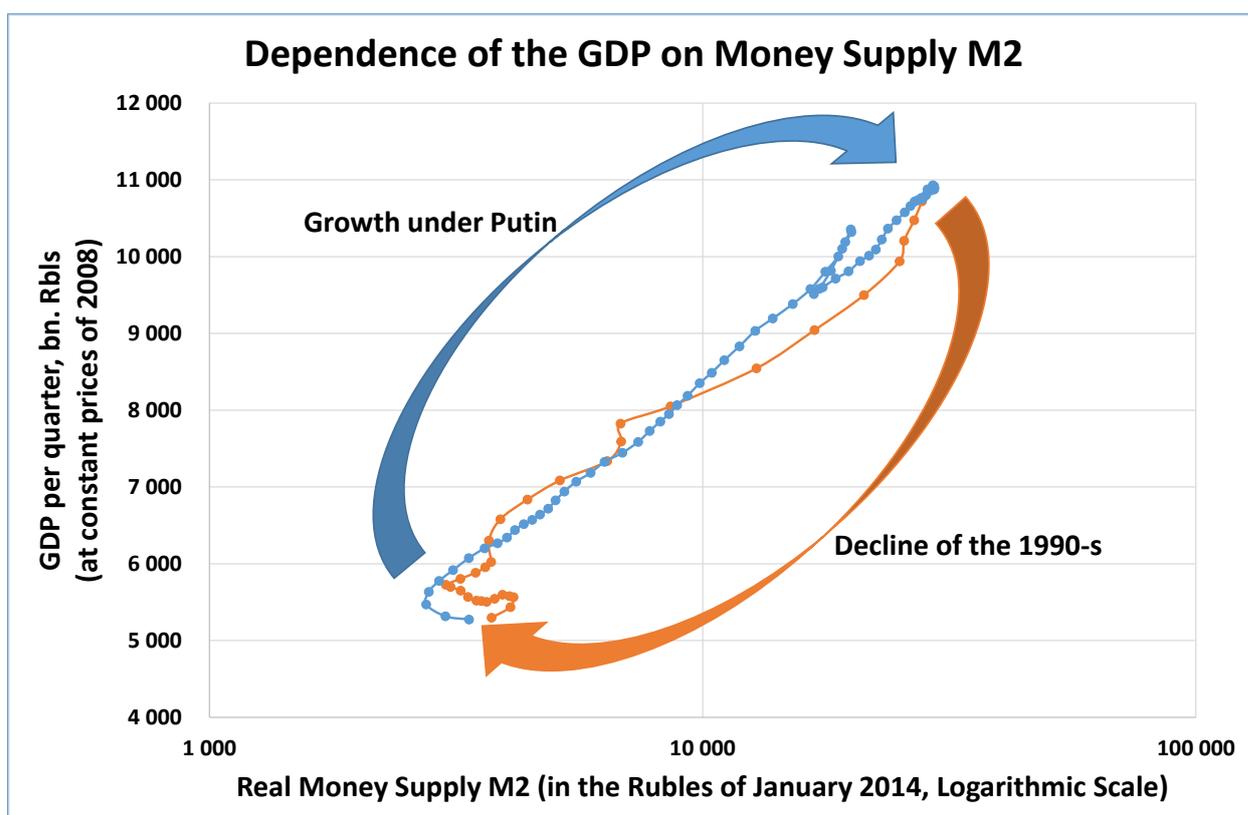
Subsequently, beginning from 2010 (point 4) and up until the 4-th quarter of 2014 (point 5), the real money supply was growing though its growth rate had been slowing up (which caused the GDP growth to slow down, too).

The second episode of money supply contraction is the present time (this particular version of the article is being written in the autumn of 2015). Since the 1-st quarter of 2014 (point 5) the real money supply has been contracting. By the third quarter of 2015 (point 6), it had contracted in relation to the previous maxima by 15%⁵. And in full conformity to our assumption that the GDP is the function of the money supply, Russia's GDP in 2015 has been shrinking.

A more long term confirmation can be obtained if we research the trend development of the real money supply during 1991-1998, when Russia's GDP almost halved. And again we see that our hypothesis regarding the influence exerted by the real money supply on the GDP is borne out (**fig. 2**).

⁵ As at January 1-st 2014, money supply in Russia amounted to 31.4 trln. Rubles. As at August 1-st 2015 (recalculated into the January 2014 Rubles) real money supply equals 26.8 trln. Rbls.

Figure 2. Contraction in the real money supply during 1991-1998 (orange line) had been causing the GDP to decline.



Source: "How to Double Russia's GDP" ([Blinov, 2015](#)). The arrows show the direction in which the indicators changed as the time went by.

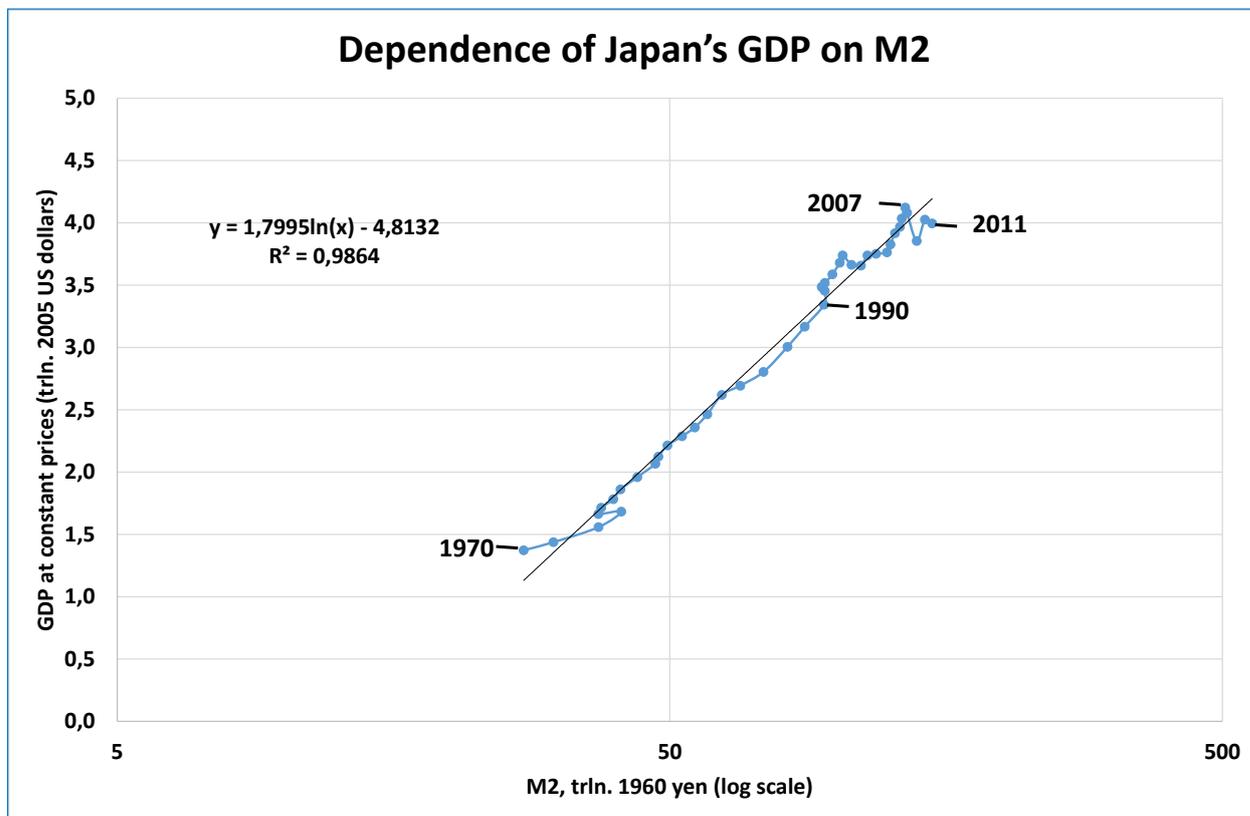
So to recapitulate, we have established that the real GDP in Russia is very closely connected with the real money supply. Does any similar linkage manifest itself in other countries? Let us consider several countries in different time periods.⁶

⁶ Specific time periods have been picked, as a rule, because during these time periods there are data available in the given sources.

Japan

Let us continue with Japan. The linkage between the GDP and money supply in Japan is shown in **figure 3**.

Figure 3. Throughout more than 40 years (1970-2011) in Japan there was observed an intimate connection between the GDP and the real money supply.



Sources: Federal Reserve Bank of St. Louis,⁷ author's calculations. Data for the period between 1970 and 2011, each point corresponds to one year.

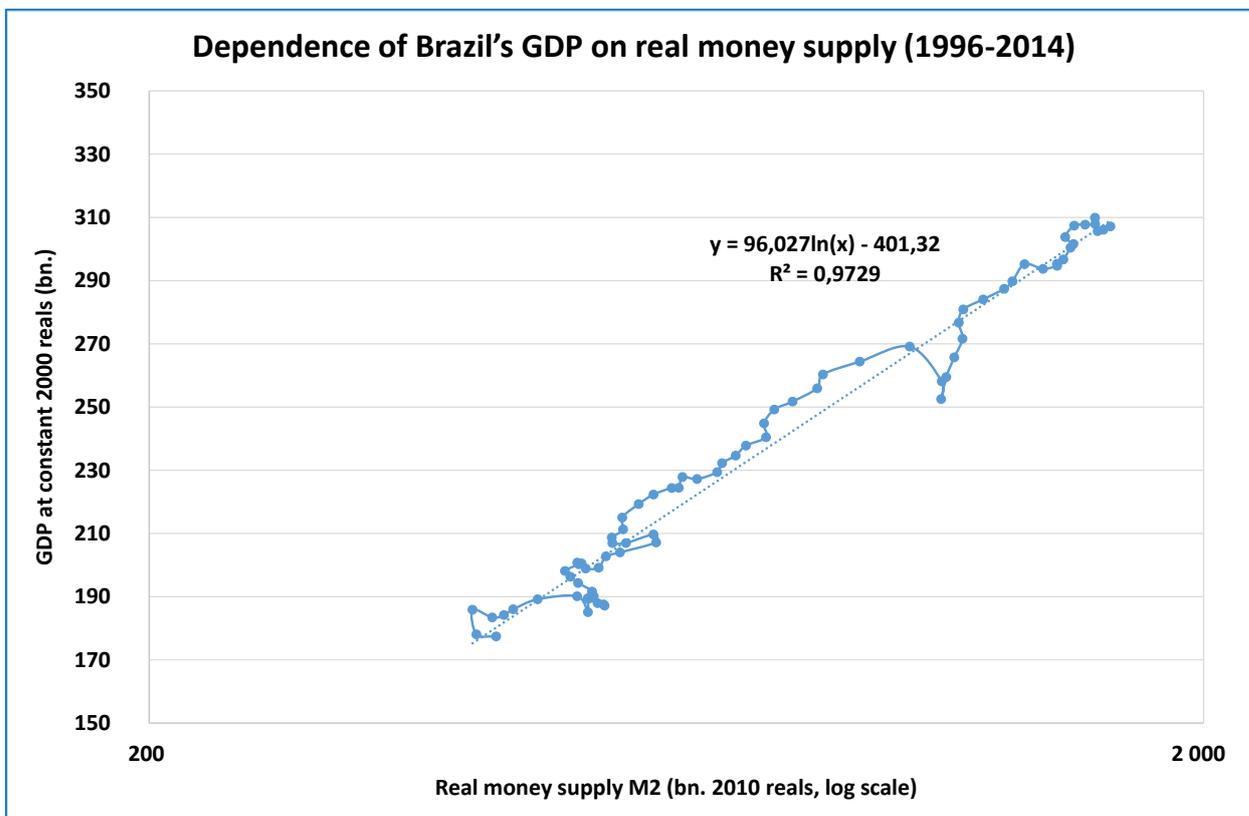
As can be seen from the above data, in Japan, throughout more than 40 years, there was observed an intimate connection between the real GDP and the real money supply. And for linear growth of the real GDP, exponential growth of the real money supply is necessary, very much the same way as in Russia.

⁷ Real GDP at Constant National Prices for Japan, Millions of 2005 U.S. Dollars, Annual, Not Seasonally Adjusted; M2 for Japan©, National Currency, Not Seasonally Adjusted; Inflation, consumer prices for Japan, Percent, Annual, Not Seasonally Adjusted.

Brazil

The linkage between the real GDP and the real money supply in Brazil is illustrated in **figure 4**.

Figure 4. The real GDP and the real money supply in Brazil are closely inter-related.



Sources: inflation and GDP – OECD, "Main Economic Indicators - complete database"⁸; money supply - [FRED](#); author's calculation. Data for the period between 1996 and 2014, each point corresponds to one quarter.

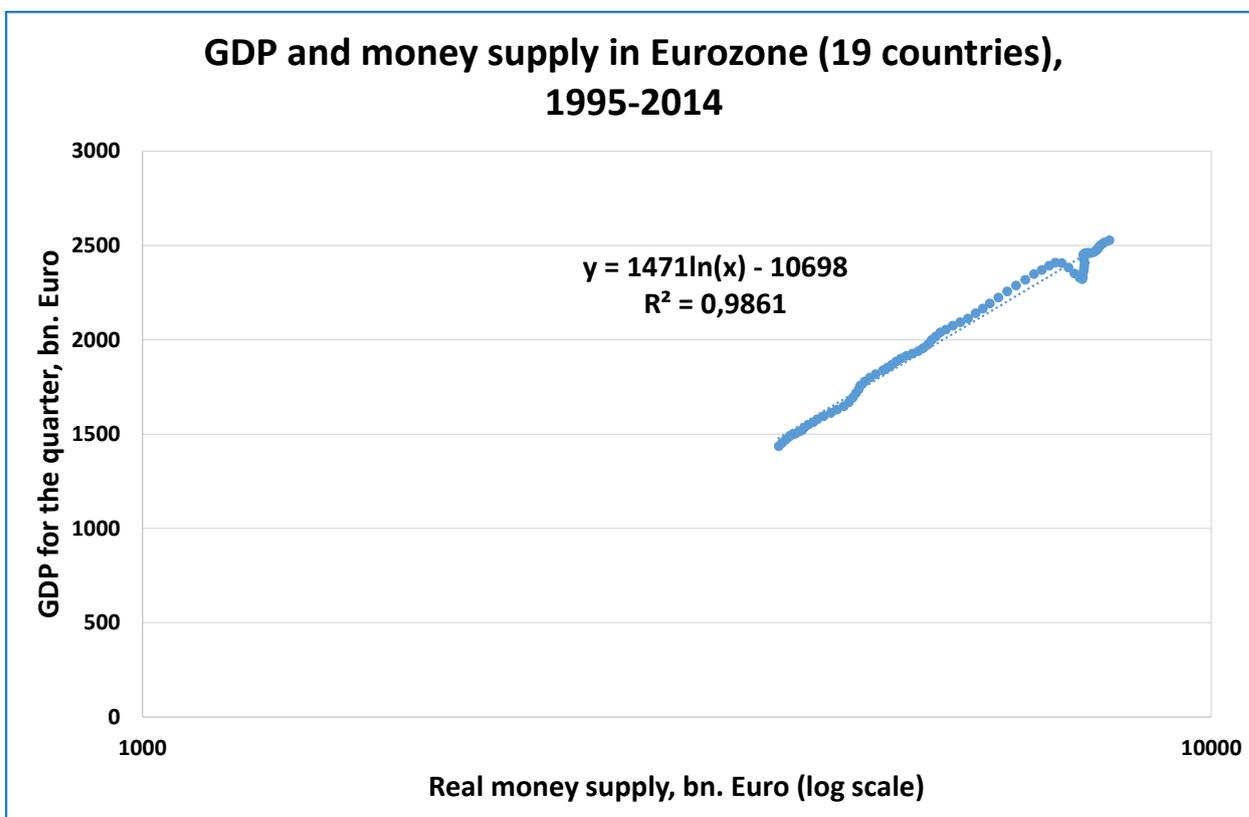
Just like in Russia and Japan, throughout 19 years in Brazil there was observed a close inter-relationship between the real GDP and the real money supply. Moreover, exactly the same way as in Russia and Japan, linear growth of the real GDP needs exponential growth of the real money supply.

⁸ Consumer Price Index: All Items for Brazil; GDP in Chained 2000 National Currency Units

Eurozone

GDP and the money supply in Eurozone (19 countries) are shown in **figure 5**.

Figure 5. GDP and the money supply in Eurozone are closely connected



Sources: [ECB](#) (inflation), FRED ([GDP](#), [M2](#)), author's calculations. Each point corresponds to one quarter. To level off seasonal variations a sliding mean for the 4 quarters has been applied. Data for 1995-2014.

And again, as in the above mentioned examples, we can witness a most close interconnection between the real money supply and the GDP.

Brief Recapitulation

The author has similar calculations and illustrations for many other countries in the world (China, India, USA and so on). However, the already considered examples of Russia, Japan, Brazil, Eurozone are enough to enable the following conclusions to be made:

1. Growth of the real GDP is very closely connected with the growth of the real money supply.
2. This connection is not linear: **for linear growth of the real GDP exponential growth of the real money supply «is required»**

Theoretical Rationalization of the Linkage Between the GDP and the Real Money Supply

How then the correlation between the GDP and the real money supply can be explained theoretically? This correlation can be inferred using one of the fundamental equations of the quantitative theory of money, which is called the equation of exchange or Fischer equation. This equation looks as follows:

$$MV = PQ, \quad (1)$$

where M is the quantity of money in circulation; V is the speed of their circulation (velocity); P is the price level; Q is the volume of goods and services sales (volume of transactions). In this equation, if we are to divide both parts of the equation by P, in the left hand part we shall arrive at the real money supply (M/P), while from the resultant equation there will follow the direct inter-relationship between the real money supply and the volume of transactions in the economy.

$$(M/P)V=Q \quad (2)$$

Certain researchers develop the result obtained above while arguing approximately as follows: the volume of goods and services (volume of transactions) from formula (2) has a positive correlation with the GDP. That is, the GDP grows with the growth of sales volume. And, on the contrary, with the falling sales volume, the GDP falls down as well. Therefore, for example, **Abel** and **Bernanke** (2011, page 340), propose the following version of this equation:

$$M/P=kY, \quad (3)$$

Where M/P is the real money supply, Y is the amount of real revenues (equivalent to the GDP), k is a constant value⁹.

As we can see from the above mentioned equations, in the economic theory there are authoritative explanations for the intimate inter-relationship between the real money supply and real GDP (as an option, the volume of revenues, volume of transactions).

Explanation for the Need for Exponential Growth of the Real Money Supply

So, the economic theory explains why the real money supply has a positive correlation with the real GDP. But why is this correlation not linear? Why is exponential growth of the money supply required for linear growth of the GDP? We shall be providing a few hypotheses below, which will enable us to approach the explanation of this phenomenon.¹⁰

⁹ Below we see that the record $M/P=f(Y)$, or even $Y=f(M/P)$ will be more accurate.

¹⁰ It has to be borne in mind that existence of these hypotheses does not obviate the necessity for an additional study of this matter – this is a prospective subject matter for further research.

Explanation One: Volume of Transactions Grows Faster Than the GDP

To start off, we shall try to understand how the volume of cash transactions changes with the economy becoming more sophisticated. The GDP calculation¹¹ is known to consider not all the revenues of the enterprises but only the revenues less expenses (added value). And this explains why more money is needed for transactions than the volume of the produced GDP. Let us consider three examples, the first of which represents the «simplest» economy from the point of view of the structure. Subsequently, with each next example, the structure of the economy is gradually getting more complicated and sophisticated.

Example 1. Let the entire economy of a certain country consist of just one firm which grows potatoes, and itself sells them to consumers in the amount of 100 thousand Rubles. In this case, the sales volume of the firm is equal to the volume of added value. For the transactions (purchase of potatoes by consumers from the firm) 100 thousand Rubles was required and the GDP in this hypothetical country also amounted to 100 thousand Rubles. The volume of transactions proved to be equal to the volume of the GDP.

Example 2. Let the entire economy of the hypothetical country consist of only two firms. Say, Firm **A** has sold the end consumers of goods, for example, tomato juice, in the amount of 100 thousand Rubles but for that purpose it used for production of juice the tomatoes purchased from Firm **B** (which this firm had grown itself and had sold to Firm **A** without intermediaries) for 70 thousand Rubles.

In this case, the sales volume of Firm **A** equals 100 thousand Rubles, while the volume of added value is only 30 thousand Rubles. For Firm **B** the sales volume amounted to 70 thousand Rubles, and the volume of added value also amounted to 70 thousand Rubles.

As in the first example, the volume of added value in this country equals 100 thousand Rubles (70+30). But the volume of consummated transactions, however, equals 170 thousand Rubles (70 thousand Rubles is the purchase of tomatoes from Firm **B**, 100 thousand Rubles is the purchase of juice from Firm **A** by buyers of juice).

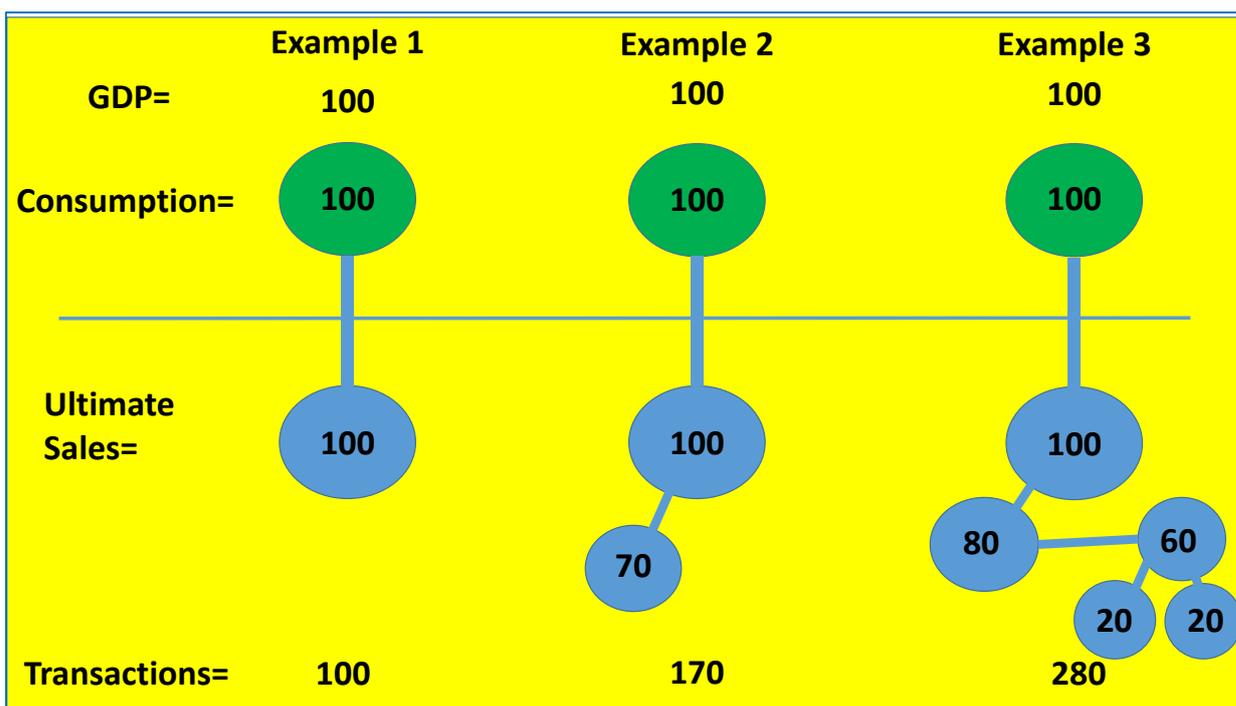
Example 3. Firm **A** has sold the end user a metal staircase for 100 thousand Rubles. To make such a staircase it used metal rolled stock bought from Firm **B** for 80 thousand Rubles. Firm **B**, in its turn, to produce the rolled stock purchased steel from metallurgical combine **B** for 60 thousand Rubles. The metallurgical combine for production of this steel had purchased coal from Firm **D** for 20 thousand Rubles and iron ore from Firm **E** for 20 thousand Rubles.

¹¹ There are three different methods of calculating the GDP, however, ideally, all the methods must yield the same result.

A fairly simple calculation shows that the total GDP produced by all the firms again made up 100 thousand Rubles. However, 280 thousand Rubles' worth of transactions were consummated (100+80+60+20+20).

This example goes to show that **as the structure of the economy becomes more sophisticated, for production of the same volume of the GDP more cash transactions are required (fig.6)**

Figure 6. As the economy becomes complicated, the volume of money transactions in it grows and, hence, grows the requirement for the quantity of money.



Source: the diagram has been compiled by the author. The numbers show sales volume (in blue figures) or volume of purchases (in green ones).

In the examples given above we implied that the producer of the ultimate goods sold the goods to the consumer itself. If we do assume that the goods were to be sold to the end consumer through a trade middleman (for example, through a retail store), the volume of consummated transactions would then be still more.

So, the first explanation that, for linear growth of the GDP, exponential growth of money supply in the economy may be required is the fact that with economic growth its structure, as a rule, becomes more complicated or sophisticated. And this considerably increases the volume of transactions in the economy.

Hence, we can make several interim conclusions.

Conclusion One. It becomes obvious that formula (2) does not lose its topicality, as it considers the volume of transactions rather than the GDP. At

the same time, formula (3) would be more accurate, if it were to be transformed and written down as follows:

$$M/P=f(Y), \quad (4)$$

where Y is GDP, M is the nominal money supply, P is the price level, M/P is the real money supply. Formula (4) means that the real money supply and the GDP are not bound up with each other by a coefficient, instead they are linked together with a more complex function.

Let us make one transformation. For that purpose, let us recall Milton Friedman's ideas discussed above. They boil down to the postulate that **economy depends on money supply**. We have determined that this postulate is backed up by actual data if we are talking about real money supply.

Based on this, it would be logical to transform formula (4) into the following:

$$Y=f (M/P), \quad (5)$$

In the examples adduced above for specific countries, this function is logarithmic and takes on the following form:

$$Y=\mathbf{A}\ln (M/P) + \mathbf{B}, \quad (6)$$

where **A** and **B** are coefficients.

It may appear to be incredible that the economy is a function of money supply (even if it is real money supply). What about new technologies, improved labor productivity, many other things that make our life better?

As a matter of fact, there is no contradiction here. For example, if we are to talk about labor productivity, then just imagine that thanks to new technologies, in a certain country the people have learned to produce steel (fabrics, aircraft, etc. as the case may be) 5 times cheaper than before. However odd it may be but it means that (given that other conditions are equal) the real purchasing power of the buyers of steel products also rose 5 times. And this, in its turn, means that nominally unchanged amount of money, in real terms, increased 5 times.

Everything looks as if growth of labor productivity were just one of the methods of increasing the real money supply.

Conclusion Two. The quantity of money impacts the structure of the economy. Shortage of money makes the economy primitive (when industries which require ramified cooperation, die out). «Cash famine» can also be conducive to creation of large integrated structures, as this reduces the need for money for mutual settlements of accounts within these structures (groups).

Therefore, saturation of the economy with money may, for example, be instrumental in developing small and medium business, as the need for integrated structures to be formed diminishes and outsourcing of auxiliary

functions develops. It can be assumed that considerable development of outsourcing at the international level during the last one and a half – two decades is also attributable to saturation with money of the international sphere of circulation.

Certain authors (Reinert, 2011, Hausmann et al, 2011) underline the inter-relationship between the complexity of the economic structure (economic complexity) of specific countries and the well-being of the residents in these countries. Incidentally, the same was pointed out by Serra mentioned above as early as in 1613, when, among the most important tools to make a country flourish and prosper, he referred to «the number of crafts»¹². While we, on our part, have arrived at the conclusion that the complex structure of the economy is not feasible without a corresponding saturation with money.

Explanation Two: Values Devalue

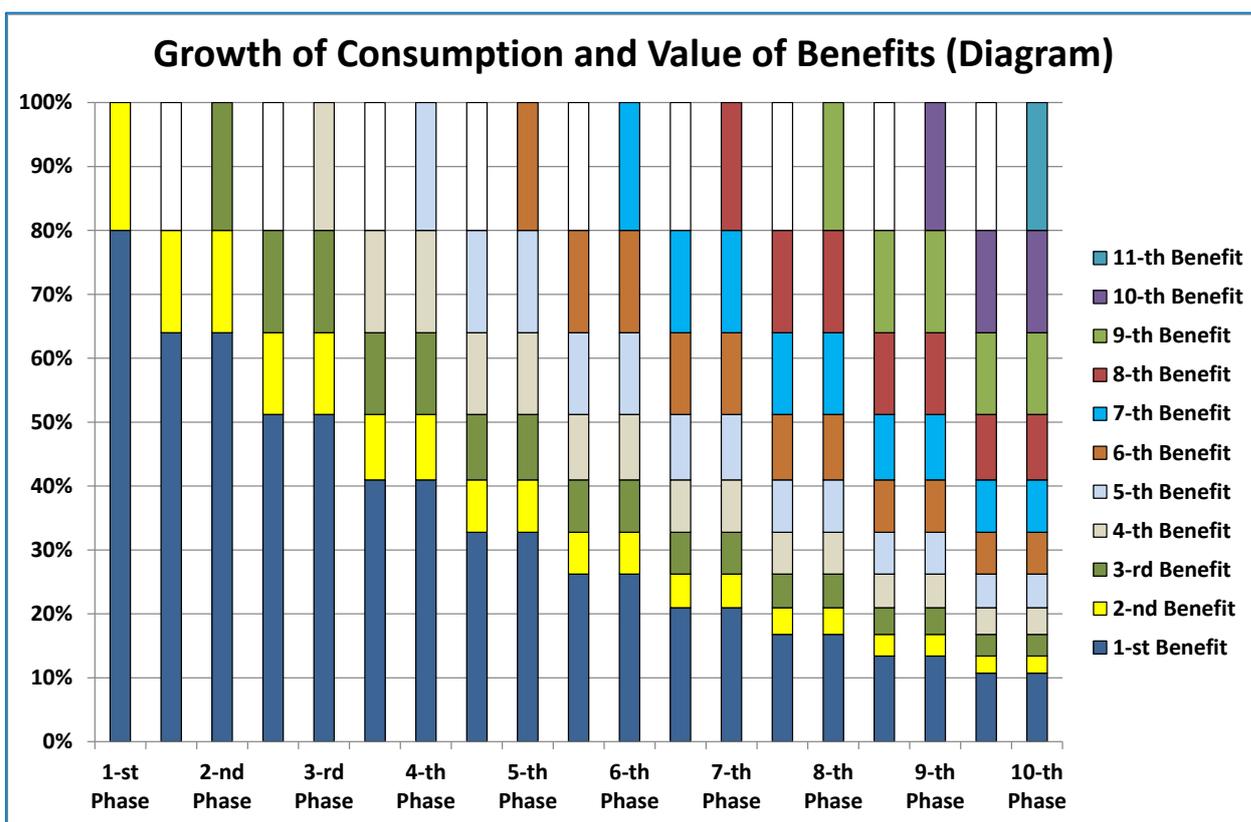
In one of the articles by this author «Time is Money. Theory of Value Depreciation» ([Blinov, 2013](#)), an idea is expounded which explains the higher value of certain benefits (for example, goods or services). Given that everything else is equal, more valuable (if gauged in terms of time costs, necessary for production of the benefits) would be those benefits that are acquired at a later date (more often than not, which appear or are invented at a later date).

The reasons for this phenomenon are described in greater detail in the above mentioned article. To cut the long story short, this has something to do with a human's assessment of his or her spare time. Given that everything else is equal, a human is prepared to sacrifice his or her free time for the sake of acquiring those benefits which are of higher value (as calculated per unit of time expended), than those which are already available to him or her.

Schematically this is reflected in **figure 7**.

¹² «Multiple and various crafts would give the state or the city money in abundance...»

Figure 7. Proportion of time (income), spent on satisfaction of the needs diminishes with growing labor productivity (growing income).



Source: [Blinov \(2013\)](#). White areas in the diagram stand for the time liberated with growing labor productivity.

This figure will be easier to understand using the vivid examples for the first and tenth phases.

Thus, it can be imagined that the first phase in it stands for the primeval cave man, who would spend 80% of his time to procure food (benefit 1, dark blue color) and 20% of the time for other benefits. In the monetary economy, in which benefits are not produced by the consumer, and are instead acquired for money, one can imagine a similar situation. For example, when an employee makes such a (low) wage that 80% of all his wage is spent on food. In certain poor countries in Asia and Africa a sizeable proportion of the population find themselves in this kind of a situation.

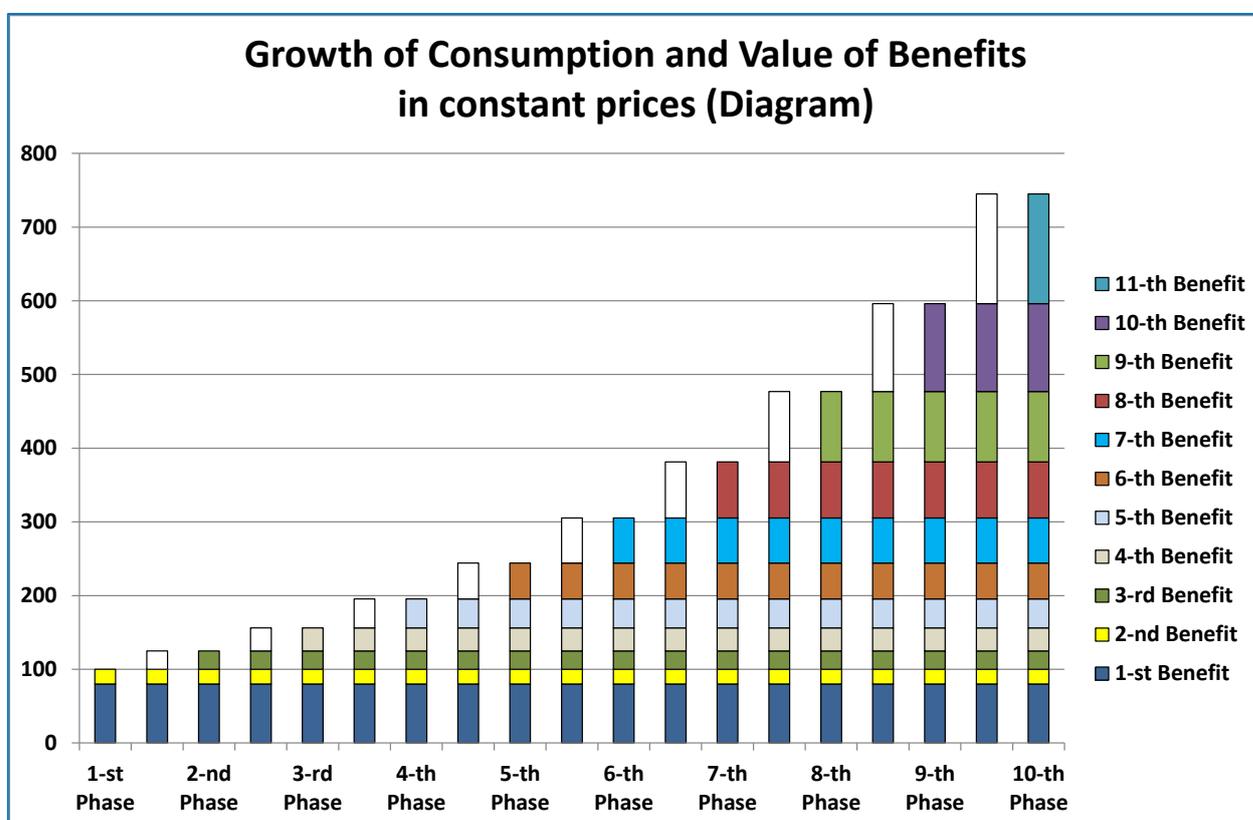
It can also be imagined that the tenth phase stands for a contemporary resident of, for instance, the U.S.A. or Western Europe. At the present time, the proportion of the food costs in the expenses of these people constitute, according to statistics, about 8-12%. Figure 7 schematically shows that the rich (resident of the U.S.A. and Western Europe) have the widest selection of benefits (goods, services) available to them compared to the poor (residents of Asia or Africa).

Figure 7 can be represented as an illustration for advancement of a certain currently wealthy nation from phase 1 to phase 10.

We have undertaken this brief survey of the theory of value in order to answer the question: why is exponential growth of money supply needed for linear growth of the GDP. And the answer to this question becomes crystal clear if we are to transform figure 7.

Just like in the calculation of the real GDP, the prices of the baseline period are used, just the same way we shall present figure 7 at the prices of the baseline 1-st phase (**figure 8**). And it can now be seen that well-being improves against the backdrop of exponential growth of the benefits' real value. And this, in its turn, requires exponential growth of the real money supply if the economy is not an in-kind economy and a monetary (cash) economy, instead¹³.

Figure 8. With the economic development, the real value of the benefits grows exponentially. In the monetary economy (where benefits are acquired in the market) this requires exponential growth of the real money supply.



Source: the diagram has been compiled by the author. Also see the explanations to figure 7.

If we imagine that the height of the columns in figures 7 and 8 corresponds to the nominal quantity of money, we shall infer some interesting findings regarding the two ways of the real money supply growth.

Way One. Figure 7 illustrates the «deflationary» growth of the real money supply. In other words, growth of the real money supply is generated by

¹³ Volume of the benefits consumed at constant prices is described by the formula $V_i \geq V_1 * 1,1^{i-1}$, where it is the phase No., V_i is the volume of benefits consumed at constant prices. This is the exponential function (ref. [Blinov, 2013](#)).

deflation with the nominal money supply remaining unchanged. The penalties concomitant to this way were vividly demonstrated by the Great Depression in the U.S.A.

Way Two. Figure 8 illustrates the «monetary» growth of the real money supply. In this case, money supply does not only grow in real but also nominal terms. Effectiveness of such a way is proved by the example of quantitative easing programs (QE) successfully implemented by Ben Bernanke.

Other Hypotheses

It is entirely possible that, along with the proposed hypotheses, some other hypotheses should be investigated. For example, an attempt can be made to explain the need for exponential growth of money supply by the declining marginal utility of money.

Daniel Bernoulli (1993), back in 1738, pointed out: «For a poor man an income of a thousand ducats is of greater importance than for a rich man while the monetary¹⁴ value is the same for both» and «...in the majority of cases the same gain gives the poor man more benefit than to the rich one».

Just let us imagine two similar groups of people in terms of their number. Let the first group be made up of poor people from Africa or Asia with an annual income equivalent to 400 US dollars per person, while the second group be composed of well-to-do residents of the U.S.A. or Europe with an annual income in the region of 50 thousand dollars per person.

An increase in the annual income by the same amount, for example, by 500 US dollars per year, will have different importance for these groups. For the first (under-privileged) group the income more than doubled, and such a change in the income will mark a radical turning point in the people's living standards. For the people from the second (well-to-do) group this change in their income represents 1%, and such a change may, to all intents and purposes, go unnoticed.

This perfectly agrees with the well-known Weber-Fechner psychophysiological law, which says that intensity of sensation is directly proportional to the logarithm of irritant intensity.

One more explanation may put it down to natural inclination to save. A poor person spends practically all the money he makes. A person in the medium income bracket, does not spend a tangible portion of his income, he saves it. And the higher the income is, the higher the portion of the income which is set by as savings. This, in a natural way, increases the need for money as a means of saving.

As more and more people switch over from in-kind economy to work for money, all the above listed factors start to play a greater role.

¹⁴ nominal

Benchmarks for Monetary and Credit Policy

The inter-relationship established in this article between the real money supply and the real GDP makes it possible to draw very important conclusions for the monetary and credit policy. Let us first consider possible benchmarks (indicators, indices) for the economic authorities.

Real Money Supply Indicator Must Be Published

It is a well-known fact that the GDP came to be calculated on a regular basis only in 1934 when **Simon Kuznets**, who subsequently was awarded the Nobel Prize, made such GDP calculation for the US economy.

In order to eliminate the impact of price changes in the GDP calculation, different techniques of calculating the GDP in real terms, that is the real GDP, were developed. Also the international standards for calculation of this indicator for the purpose of comparing the economies of different countries with higher correctness were worked out. In Russia this indicator has been computed since 1990.

With all the flaws of the GDP as the indicator (and there are such flaws), the real GDP and its trend development (both on the whole and per capita) are a generally recognized indicator of economic development in different countries¹⁵.

Calculation of another important indicator, which is the nominal money supply, has come to be made in the U.S.A. fairly recently, only after the publication of the above mentioned revolutionary work by Milton Friedman and Anna Schwartz in 1963. In Russia, the Central Bank has been posting the indicator of money supply M2 on its website since 1992.

However, the indicator of nominal money supply has one most important drawback: it does not consider price changes. This work establishes a most close inter-relationship between the indicator of the real GDP and the indicator of the real money supply M2. But *such an important indicator as the real money supply is not published by statistics departments or central banks (table 1)*.

¹⁵ Along with the other ones, such, for example, as human potential development index (HPDI).

Table 1. By a weird quirk of fate the real money supply indicator does not get to be published by the Central Banks or statistics offices¹⁶. This gap must be bridged.

	Nominal	Real
GDP	Published	Published
Money Supply	Published	Not published

Source: the table has been created by the author

From the author’s perspective, this is a serious drawback of the existing systems of economic indicators. Given the importance of the real money supply, it can be boldly recommended that the economic and statistics departments should publish the data on the real money supply on a monthly basis.

Meanwhile certain problems will have to be dealt with among which two can be referred to.

Firstly, it would be necessary to determine which price level it would make sense to use to reduce the nominal indicators to real ones. In the data cited above with regard to Russia, Japan, Eurozone, Brazil, the author used the data on consumer price index (CPI).

Secondly, it would make a lot of sense for the international organizations (UN, IMF) to institute internationally recognized methodologies to calculate the real money supply (the same way as this is done to estimate the GDP), to facilitate international comparisons.

¹⁶ There are some exceptions, for example “Real M2 Money Stock” <https://research.stlouisfed.org/fred2/series/M2REAL>

Indicator of Economy Monetization Cannot Be a Benchmark

In some works by economists, in public discussions of the economic policy,¹⁷ such an indicator as monetization of economy is used. Monetization of the economy is called the ratio of money supply to the annual GDP.

But based on the fact that exponential growth of the real money supply corresponds to linear growth of the GDP, the monetization indicator cannot be a clear benchmark because it changes quite drastically as the economy grows.

With the GDP doubling, the money supply, for example, may grow by the order of magnitude. And the ratio between the money supply and the GDP, i.e. monetization, will change greatly.

This is exactly why situations are possible where such countries as Japan, with GDP monetization at the level of about 200%, can stagnate for decades, as was the case with Japan during the 1990s and 2000s. And at the same time, the countries with low GDP monetization may demonstrate miraculous growth. Thus, for instance, during 1999-2000, the level of monetization in Russia was at the level of approximately 20%, but the economy had been growing at an annual rate of 6-10%.

On the other hand, a high level of monetization does not mean unconditional stagnation in the economy at all. Thus, for instance, the level of monetization in China is quite comparable to that in Japan and amounts to approximately 190%. Despite this, economic growth rates in China exceed the same indicator in Japan by several orders of magnitude. It does not make much sense to talk about «monetization trend development», as this indicator is derived from money supply trend development indicator.

Visual Graphic Representation

The diagrams, set out above, (figures from one to five), highlight fairly well the inter-relationship between the indicators but they are not so good at showing the trend development of the indicators. Greater distance between the points means faster change, lesser distance between the points stands for slower change in the indicators. If there is no trend development, then many points at once are concentrated in one spot.

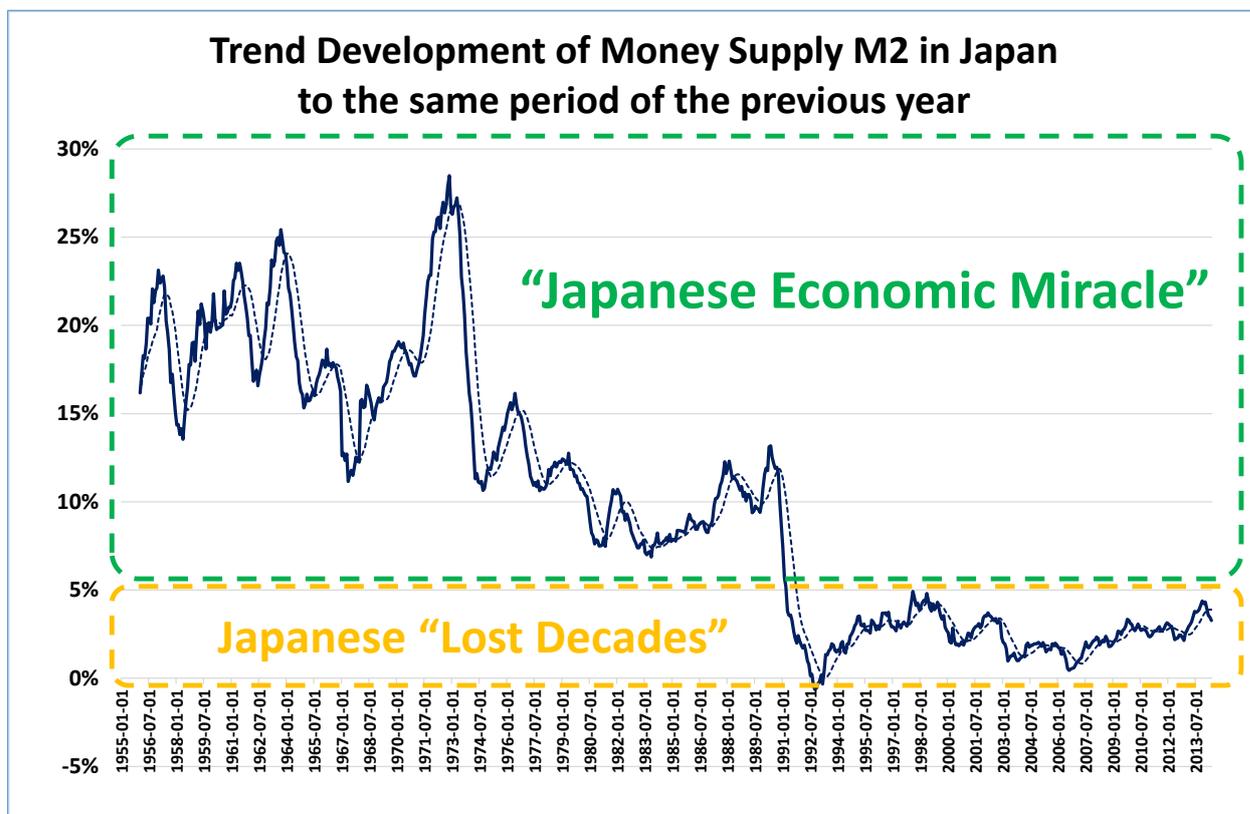
The direction of indicator movement cannot be seen in such a representation, either. This is exactly why in figure 2 arrows had to be used to show in which direction the indicator was changing as time went by. These problems can be resolved in several ways.

Diagram of Real Money Supply Growth Rate

The first method is to show on the time scale the trend development of the real money supply (**figure 9**)

¹⁷ See, for example, the discussion of the annual report by the Central Bank of Russia at the State Duma in June 2015 <http://transcript.duma.gov.ru/node/4307/>

Figure 9. From the diagram of the money supply trend development it can be seen how its low or negative growth rates correspond to the problems in the economy (using the example of Japan)

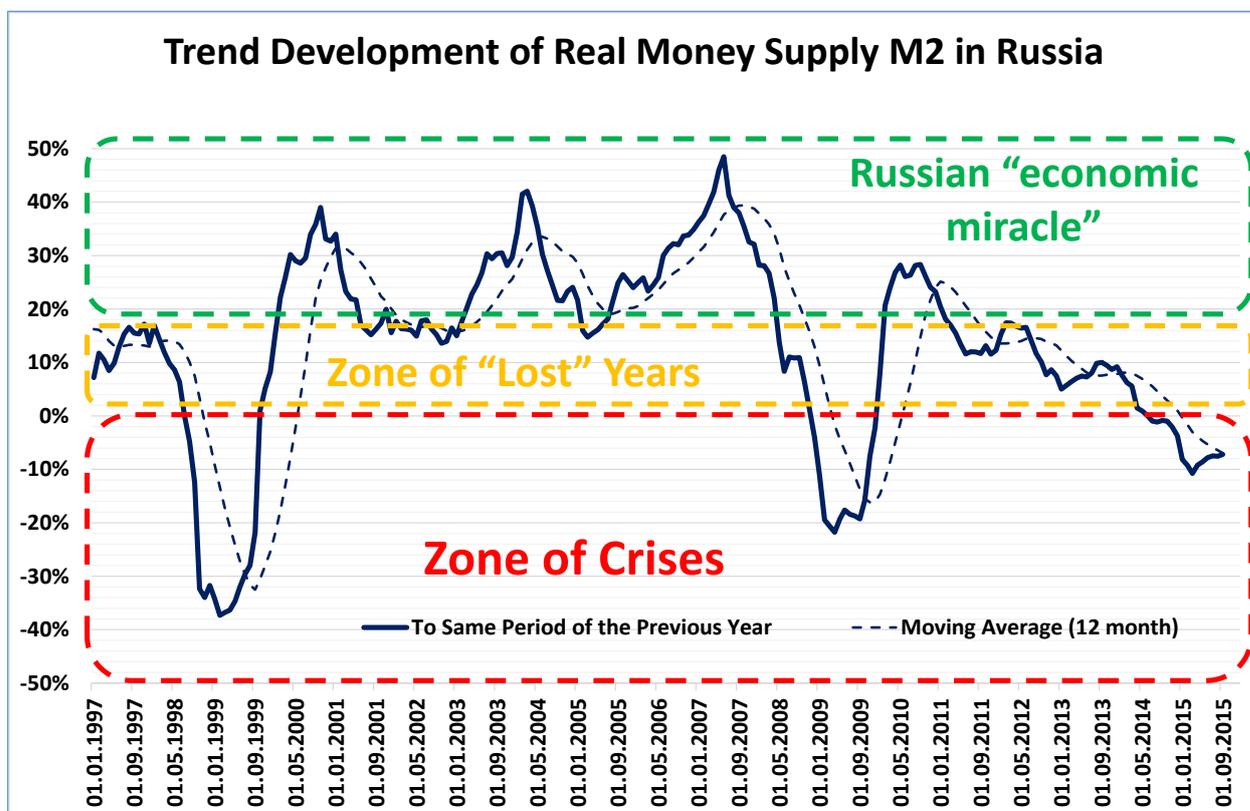


Source: Blinov (2015b) «[A Good Example for the Central Bank](#)»

This figure visually illustrates that high growth rates of the real money supply correspond to the «Japanese economic miracle», the period of booming growth of the Japanese economy (green zone). Whereas low growth rates of money supply correspond to a period of low growth rates, the so called «lost decades». Such a diagram allows one to see clearly, for example, that Japan’s exit from the stagnating «lost decades» would be possible if the growth rates of the real money supply exceeded 7.5%.

In such a representation, each state of the GDP trend development corresponds to a definite range of the real money supply trend development. In **figure 10** such ranges are shown using Russia as an example.

Figure 10. Russia's example shows that the trend development of the real money supply accounts very well for all the crises (1998, 2008), and the causes of gradual economic slowdown from 2011 to 2014, as well as the causes of the GDP decline in 2015.



Source: Blinov (2015b) «[A Good Example for the Central Bank](#)»

This diagram can be «read» as follows.

- When the growth rates of the real money supply are in the green zone of the diagram, Russia's GDP is growing successfully.
- When they move to the yellow zone, the slowdown of the economy begins, primarily due to reduced investment demand.
- In the red zone of the diagram, the GDP decline is observed.

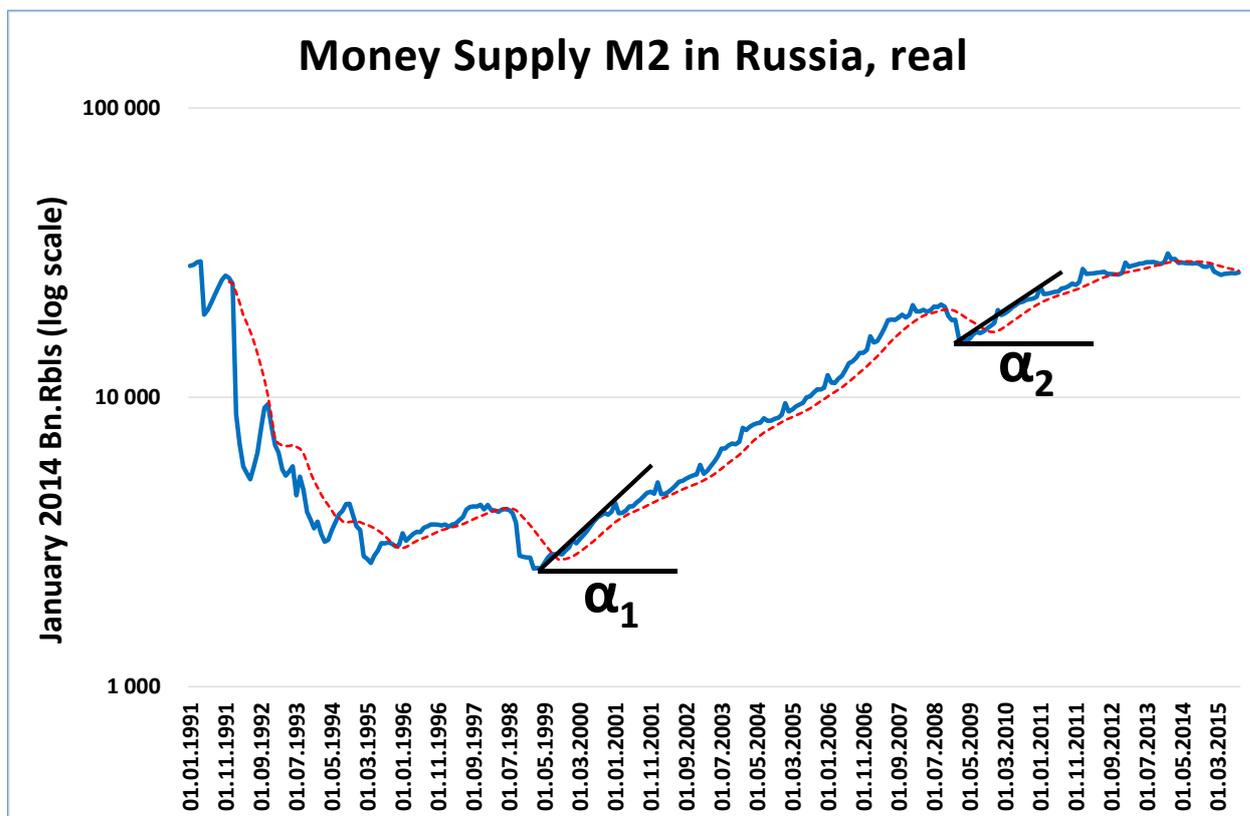
The position of the real money supply growth rates is also meaningful (thick blue line) relative to its sliding mean (blue dotted line).

- If the thick line is below the dotted one, it means that economic agents are typified by pessimism.
- If it rises above the dotted line, it means the economy is starting to show hope for improvement.

Logarithm of Money Supply on the Time Scale

Another way of visually assessing the real money supply can be its direct reflection on the time scale. Given the exponential character of the growth indicator, for better visualization it has to be plotted on the log scale. Let us consider this type of the diagram using the Russian data (**figure 11**).

Figure 11. The incline angle of the blue line corresponds to the growth rate of the GDP. The red dotted line shows the average of the real money supply for 12 months.



Source: Central Bank's data, Rosstat data, author's calculation. Also, see «[Current Crises, Its Causes and Necessary Measures](#)», figures 8-10.

How is the graph in such a representation to be «read»? Of great importance for assessment of impact by the real money supply on the GDP is the incline angle of the blue line, i.e. money supply graph.

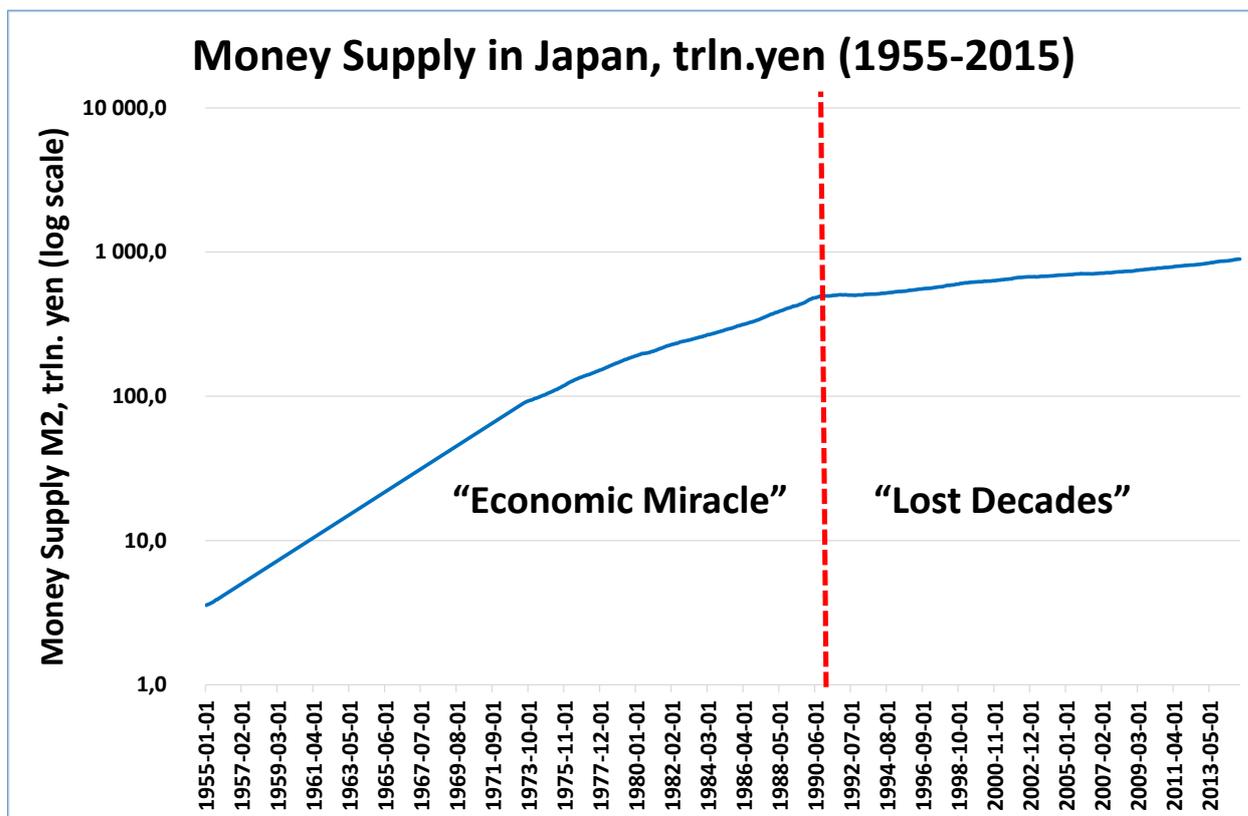
- If the blue line is directed upward, the real money supply is growing, the GDP is growing
- If the blue line is directed downward, the real money supply is decreasing, the GDP is decreasing.
- If the angle α_1 is greater than the angle α_2 , the GDP growth at the first section is higher.

It also matters where the graph is positioned relative to the moving average of the indicator (in the graph it is the average for 12 months).

- If the blue line crosses the red dotted one from bottom up or is above the dotted line, optimism becomes prevalent in the economy.
- If the blue line crosses the red dotted line from top down or is below the dotted line, pessimism begins to predominate in the economy.

The following is what the diagram of similar kind looks like for Japan (**figure 12**)

Figure 12. Reduced incline angle of the graph (slowdown in the growth rates of money supply) corresponds to the slowdown of economic growth rates.



Source: [FRED](#), author's calculations.

Judging by this diagram, one can safely assume that before the 1970-s Japan experienced vibrant growth, then until the beginning of the 1990-s growth continued at somewhat slower rate, and from the beginning of the 1990-s until the present time, a very moderate growth has been observed.

Please note that these are just suppositions, which have been made judging by the trend development of money supply. But these suppositions are completely borne out by Japan's GDP statistics. Before the beginning of the 1970-s, GDP growth in Japan exceeded 10% a year. Then until 1990 inclusive, the average growth rates of the GDP amounted to approximately 5-6%. While starting from 1991 until 2014, the average growth rates amounted to 2.2%, which is significantly lower than the average global growth rates for the same period.

Practical Conclusions for Macroeconomic Policy

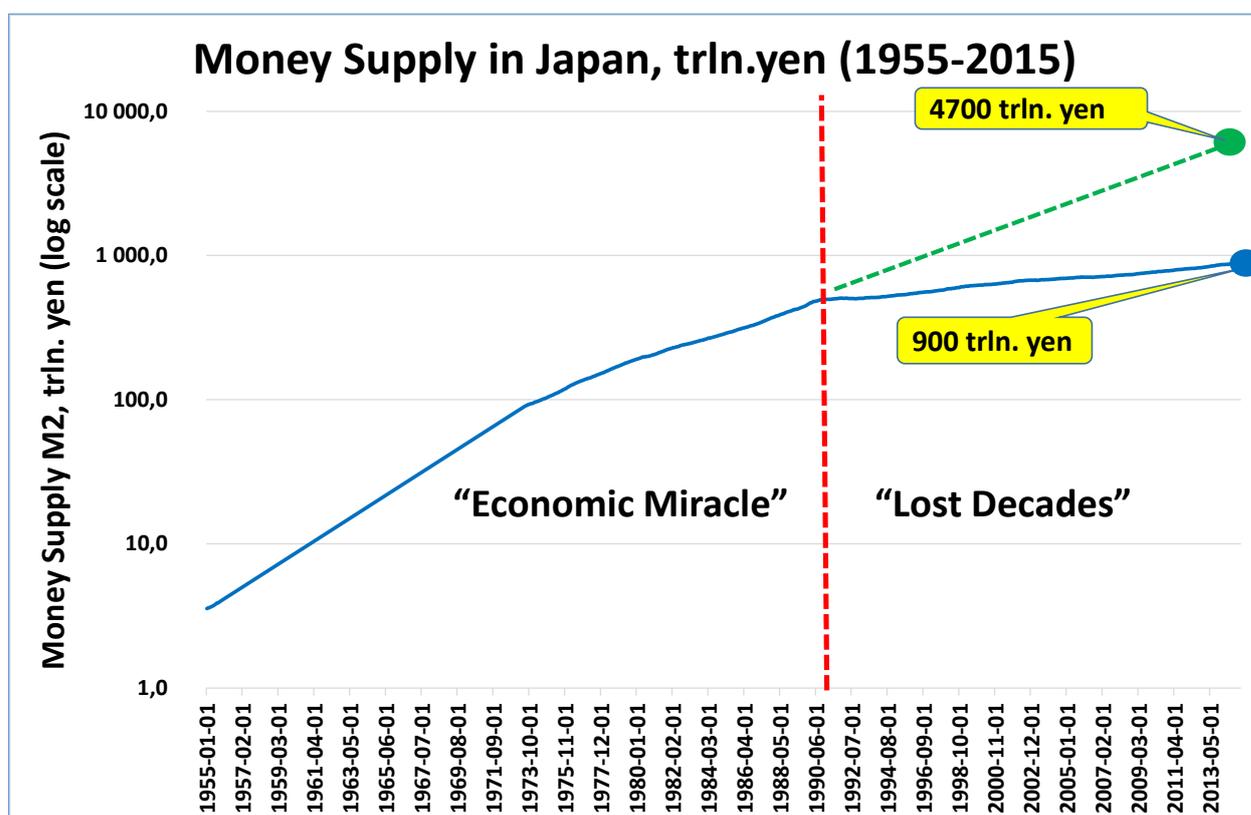
The dependence which we have inferred makes it possible to make several very important conclusions for the macroeconomic policy. They are worth discussing in greater detail in a separate article. However a few important points can be emphasized right now.

Priority of the Monetary Policy over the Fiscal Policy

The need for exponential growth of money supply to ensure that the economy grows brings to the fore the Central Banks and the monetary and credit policy that they wage. Finance Ministries (or Governments) are in a position to influence the money supply (see, for example, [Blinov, 2014b](#)). But they cannot be just as effective in their attempts to ensure money supply growth using the budget policy tools.

The main advantage of Central Banks consists in the fact that governments, to put it bluntly, are constrained by the amounts of taxes collected. At the same time, Central Banks do not have such constraints. Let us review this using the example of Japan (**figure 13**)

Figure 13. In order to keep high growth rates of the GDP (about 5% as during the period between 1973 and 1990) Japan had to build up money supply by early 2015 approximately to 4700 trln. yen (green dotted line). Budget policy measures in such a situation are not effective.



Source: see fig. 12. Green dotted line shows the trajectory of money supply provided its growth rates remains the same as in 1973-1990.

As can be seen from this figure, for high economic growth to be retained, the Japanese economic authorities had to boost the money supply up to 4700 trln. yen by the beginning of 2015. This exceeds more than five times the actual value at 900 trln. yen.

In order to think these numbers through, one has to know that the GDP in Japan based on the 2014 results amounted to less than 500 trln. yen at

current prices, while the public debt as early as in March 2013 exceeded 1000 trln. yen (on the order of 200% of the GDP).

It becomes obvious that with such a level of public debt, boosting it further more than 4 times is very problematic. This is exactly what the fiscal policy constraint consists in. At the same time, there are not such constraints for the Bank of Japan to conduct an active monetary policy. However, it is not using its capability. *«For more than 20 years the Bank of Japan was acting quite indecisively. Even using the tool "quantitative easing" which was new for that time period, it did it somewhat half-heartedly, providing just a token growth of money supply. And the 2000-s came to be called the second «lost decade». I am convinced that it was precisely this monetary «firmness» (or, to be more exact, insufficient softness or easing) that was to blame for the two lost Japanese decades ... And the reason being the Bank of Japan's indecision»* ([Blinov, 2015b](#)).

[Accumulation of Foreign Exchange Reserves is a Boon, Currency Interventions are an Evil.](#) As some works note ([Popov and Polterovich, 2002](#); [Blinov 2014b](#)), accumulation of foreign exchange reserves correlates very closely with economic growth.

On the other hand, currency interventions to protect the local currency (as a rule, to prevent it from weakening) almost always coincide with significant problems in the economy. Episodes of such kind are featured in the history of Argentina, Brazil, Russia and many other countries.

The dependency, which we have established between money supply and the GDP, enables such episodes to be explained. The point is that accumulation of foreign exchange reserves causes money supply to grow while currency interventions, on the contrary, cause money supply to contract. At this point it would be appropriate to underline that money supply in the national currency¹⁸ is of importance to the country.

When, during the period between 1999 and 2008, Russia was active in replenishing the gold and foreign exchange reserves, as a result, the economy was awash with tens of trillions of Rubles. While the growing Ruble denominated money supply caused the economy to boom.

And vice versa, when during the crisis stricken autumn of the year 2008, the Central Bank of Russia spent more than 200 bn. Dollars on currency interventions, as a result of such interventions, more than 5.5 trln Rubles was withdrawn from the economy. And it was exactly this reduction in money supply that, in its turn, led to a situation where the decline in Russia's GDP was the worst among all the "big twenty" countries.

¹⁸ Therefore, the money aggregate of the so called «broad» money supply, which includes deposits in foreign exchange, does not have such a close interconnection with the GDP as the regular aggregate M2.

The fact that Russia had gigantic gold and foreign exchange reserves did her a disservice. Since the other countries which did not have such foreign exchange reserves to support their local currencies, were better off, as they had not carried out any interventions (and, hence, withdrawals of money supply).

This is very much reminiscent of the episode described above where the countries which had gone off the «gold standard» before others, were quicker to pull themselves out of the Great Depression. And, on the contrary, the countries, which were clinging to the «gold standard» longer, suffered from a longer crisis. Among such countries was France, for example, whose large gold reserves did this country a disservice. This reminds one of Russia's example in 2008.

Purchase and sale of foreign exchange are only one specific case of different operations performed by Central Banks in the foreign exchange market. That is why the general rule can be framed as follows:

- The transactions in the open market which result in reduced money supply make the economy decline or slow down.
- The transactions in the open market which cause money supply to grow contribute to the pickup of the economy (or cause recession to stop).

General Approach

Many other conclusions for the macroeconomic policy can be drawn from the dependence which we have established. However, the general principle is clear enough: one should avoid actions (or inaction), which lead to contraction or slower growth of the real money supply. And, vice versa, one should take advantage of all the existing opportunities in order to ensure such growth rates of the real money supply as correspond to good growth rates of the economy.

Prospective Avenues of Further Research

The dependence between the real indicators of money supply and the GDP established in this article opens up broad prospects for further research. By way of example, I shall refer to two possible areas.

U.S. Phenomenon

In a strange way, in the case of the U.S.A., unlike other countries, a closer and more clear-cut dependence of the GDP on the nominal money supply rather than on the real one can be observed.

One of the possible explanation can be that the U.S.A., being the world's largest economy, serves, as it were, as a reference point, a benchmark for other countries. And, therefore, inflation (or deflation) in the USA does not exercise the same influence on the development of the economy in the country. It is entirely possible that the cause of this phenomenon lies in the

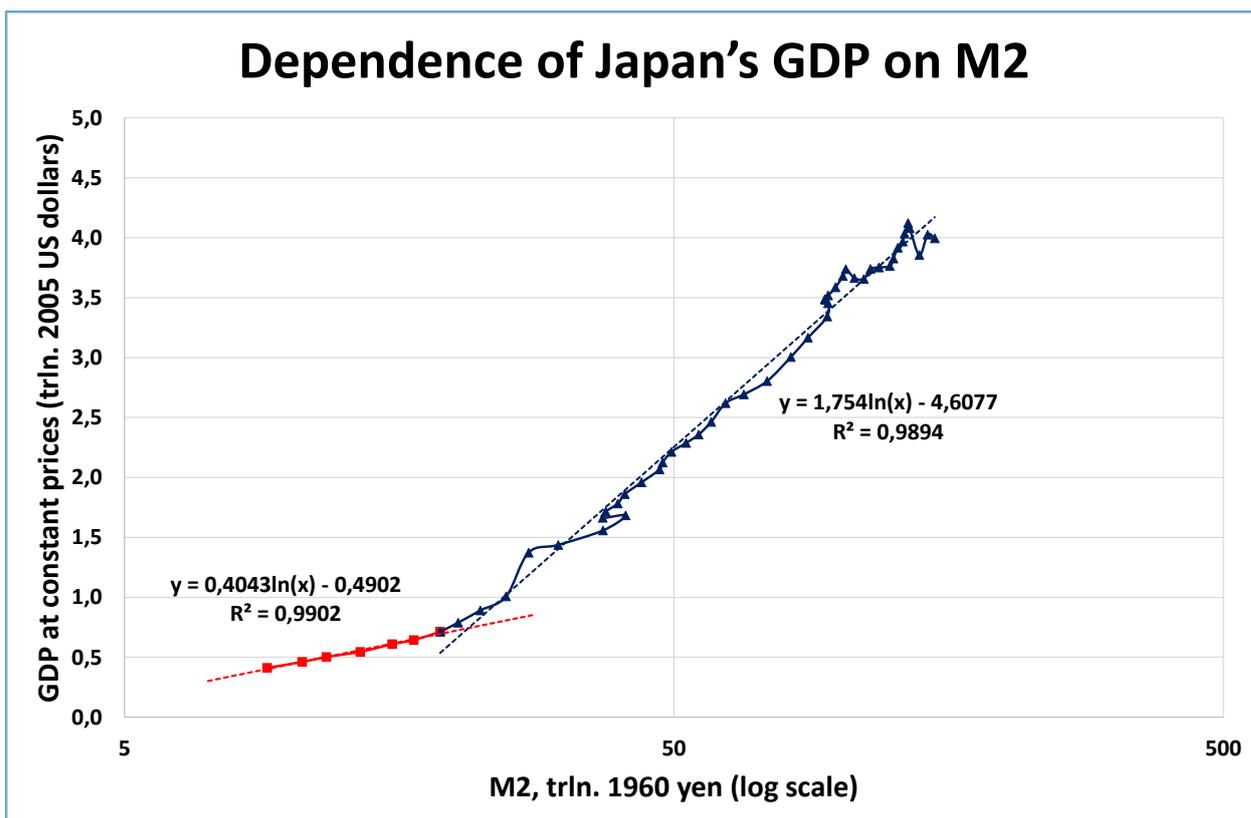
trend development of the oil prices (for example, if cheaper oil allows the USA economy to grow even with the money supply being unchanged).

In any case, this may be an interesting area for further research.

Different «Effectiveness» of Money

In Japan, since 1960, there have been two periods during which effect of the money supply on the GDP considerably differed (**figure 14**)

Figure 14. During 1960-1966, the effect of the money supply on the GDP differed from its effect during 1966-2011.



Sources: Federal Reserve Bank of St. Louis,¹⁹ author's calculations. Data for the period between 1960 and 2011, each point corresponds to one year. Red color 1960-1966; blue color – 1966-2011.

It can be said that the build-up of money supply during 1960-1966 was less effective from the point of view of its influence on the GDP growth. Similar episodes of greater or lesser effectiveness of money are also noticeable in other countries, too (see figures 1-5).

Ascertaining the causes of greater or lesser effectiveness of money supply is a very interesting area for further study. It is also interesting to ascertain the causes of different effectiveness of money in different countries. It is clear that this efficiency is closely connected with such an indicator as the velocity

¹⁹ Real GDP at Constant National Prices for Japan, Millions of 2005 U.S. Dollars, Annual, Not Seasonally Adjusted; M2 for Japan©, National Currency, Not Seasonally Adjusted; Inflation, consumer prices for Japan, Percent, Annual, Not Seasonally Adjusted.

of money (speed of money turnover). But it is important to understand what this indicator depends on and how it can be impacted by the measures of monetary and credit policy.

Conclusion

The results and ideas set out in the article allow one to take a new look at the macroeconomic policy. They also allow one to use the dependences established to steer a more balanced macroeconomic course primarily in the monetary and credit sphere. Implementation of these ideas may assist the world economic growth, improve human well-being in poor countries.

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