Journal of Business & Financial Affairs
ISSN: 2167-0234

Dai, J Bus Fin Aff 2018, 7:1
DOI: 10.4172/2167-0234.1000315

Review Article Open Access

The Physical Aspect of How Monetary Policy Functions

Rongqing Dai*
McGill University, New Jersey, USA

Abstract

This writing provides a philosophical discussion on the effect of monetary policy through the metaphysical analysis of money and its circulation. Unlike most writings on this subject, this writing focuses on the circulation of money at its face value instead of its buying power or market value, which is under the influence of conservation law. The goal of this writing is to lay out some basics for metaphysical analysis upon the physical nature of money circulation.

Keywords: Money; Circulation; Monetary policy; Conservation law

Introduction

Money and its circulation to the modern economy are similar to blood and the circulatory system to human life. With its buying power and accordingly the capacity of storing wealth, money not only helps individuals to acquire their supplies for working and living, but also through its global circulation helps building up, organizing, and maintaining the social structure of any economy in this world, and helps mobilizing human and material resources for the survival and development needs around the world. Besides, money also helps to expand the market in logic and in substance along the historical course. As a result, money and its circulation become a critical factor for all aspects at the micro and macro scopes of any economy. Accordingly, the variation of the quantity or relevantly its velocity of circulation in the market would no doubt impact the health of the economy [1]. This impact establishes the need for *monetary policy* in the modern economy.

Monetary policy is an important tool for governments to influence or control the economies at the macroscopic level around the world through adjusting the money supply in the market. There are many different mechanisms for governments or central banks to carry out their monetary policies. Some of them are viewed as conventional (such as adjusting interest rates, changing monetary base and reserve requirements, as well as open market operations of buying and selling various financial instruments including treasury bills, company bonds, or foreign currencies, etc.), and some are viewed as unconventional (e.g., Quantitative Easing), but all with a common goal of influencing the money circulation in market by adjusting the money supply in the economic systems (or countries).

Economic systems are complicated multidimensional dynamic systems, and so would be the impact of monetary policy upon the economy, which can thus be studied through different approaches. While how money is created and functioning is one of the rudimentary subjects of modern economics [2], in this writing the relevant issues would be examined through metaphysical analysis, which might quite different for many readers from what they have been familiar with in popular textbooks of economics. The discussion in this writing would be divided into three main parts and then followed by a closing words section. The first part would be a dynamic analysis of the circulation of money and the second part would be a metaphysical analysis of the relationship between money and economy, which would be followed by the third part that offers a metaphysical discussion of monetary policy as well as a fairness analysis from the point of view of economic relativity [3]. Then, the author would wrap up the philosophical discussion of this writing with a closing words section.

Dynamic analysis of money movement

The information of money movement has been mainly collected through various static reports such as balance sheets and profit and loss statements from global banks, government agents, as well as various local enterprises around the world. However, since during any transaction, the amount of money is an *invariant* (i.e., the money passes from one party to another at its original face value) we might investigate the circulation of money and its impact on economy from a much more dynamic angle similar to what natural scientists have done in the area of hydrodynamics [4].

In hydrodynamics, the movement of the material (e.g., water) is determined by three types of controlling factors: 1) conservation laws (of energy, momentum, and mass); 2) constitutive relations; and 3) initial and boundary conditions. Where the conservation laws reflect the invariant restrictions of the moving material, the constitutive relations reflect the nature of microscopic interactions that drive the material to move, and the initial and boundary conditions reflect the historical and environmental influences.

From a metaphysical point of view, we could see that the movement of money would also be determined by three types of controlling factors:

1) The conservation law, which in general can be laid out for an identified system as:

   a. Influx of Q-Outflux of Q=Increase of Q-Production of Q+Reduction of Q,

where Q is the invariant in movement such as money in circulation discussed herein;

2) Economic principles such as pursuit of interests and exchange of needs; and

3) Initial and boundary conditions.

The changes of the total amount of money through money production or destruction would not change the tautological nature of

***Corresponding author:** Rongqing Dai, McGill University, New Jersey, USA, Tel: +0017185147243; E-mail: Ronald_dai@yahoo.com

Received January 17, 2018; **Accepted** February 01, 2018; **Published** February 06, 2018

Citation: Dai R (2018) The Physical Aspect of How Monetary Policy Functions. J Bus Fin Aff 7: 315. doi: 10.4172/2167-0234.1000315

Copyright: © 2018 Dai R. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

the conservation law of money, and we could take into consideration of the effect of those changes by introducing the concepts of source and sink when applying the law to explain or analyze the impact of money circulation, where the source is the new supply of money into the circulation, and the sink is the destruction of the existing money from the circulation.

In hydrodynamics, for multiphase flows, we are familiar with the following basic types of movement: 1) laminar flow or simple main flow with uniform velocity [5]; 2) waves; 3) diffusion of locally high concentrated solutes; 4) dissipation of initial disturbance (such as dissipation of wave energy); 5) movement in the combined state of the previously mentioned types of movement; 6) stay still in one place. Because we could obtain very good knowledge about how moving materials interact with each other (i.e., constitutive relations) and with the environment, we could work out sophisticated mathematical formula or equations from the conservation laws (in the form as discussed earlier) to describe the diffusive, wave, convectional, or dissipative behavior of the movements of the moving materials. We could then get quite precise (even though not the exact) quantitative solutions of the movements.

However, for the movement of money, due to the hard-to-predict nature of interactions between the money carriers (people or human organizations), we are still far from the stage to work out any neat mathematical system from the conservation law, from which we might easily calculate quantitative solutions. Even though metaphysically speaking we might still observe the diffusive, wave, convectional, and dissipative behavior during the physical movement of money no matter what physical forms the money takes (e.g., paper or electronic), we would not be able to get mathematically precise determination of the behavior for the movements of money [6-9].

Nonetheless, being aware of the conservation law as well as different nominal forms of behavior of the physical movement of money could help us to have a correct sense of the dynamic nature of money circulation in the market, and thus, at least, to avoid oversimplifying the physical restriction of money movement (so that people would not wrongly assume that as long as the central banks inject money into market (e.g., QE), the effect is simply in proportion to the amount injected).

The conservation law of money is in fact a critical law to the fairness in the trading based market economy, which essentially guarantees the protection of personal wealth during trading. A clear awareness of this law could help us to see through the dazzling market complexions and better comprehend common phenomena in the market economy [10]. For example, when the stock market crashes, we often hear some people cry about how much money evaporates during the crash. But from the conservation law of money we know that what evaporates is not money but only the unrealized potential wealth which would not be the true wealth until it is transferred into money through trading. The so-called stock values are the nominal numbers, which is expressed in the unit of money, created by transactions using real money; therefore, all the money involved in the transactions has already flowed from the pocket of the buyers to the pocket of the sellers of the stocks. Many nonprofessional investors lose a huge amount of money in the stock market simply because they do not understand this conservation of money during the whole transactions.

One important manifestation of the complicated dynamics of the economy is that under the so-called fair competition, a large amount of social wealth would be accumulated for very few social members instead of being distributed evenly among all the people. Accordingly, the amount of money would not be distributed evenly among the social members even though there is no simple proportional relationship between wealth and the ownership of cash. Therefore, from the dynamic view of money movement, we could say that the mechanics of money circulation in the market economy itself contains a mechanism for continuously driving the money to distribute in a very unbalanced state until some unusual factor to interrupt this trend.

Money and Economy

Even though we are still far from having a sophisticated mathematical system to solve economic issues as we could do in hydrodynamics starting from the conservation laws, the knowledge of the physical nature of money circulation as I discussed above could help us have a better understanding of the role of money in economy and thus the role of monetary policy in economy.

Money could be introduced to audience by its evolution through the history from the commodity money (i.e., gold, silver, etc.), representative money (paper or coins tied to a commodity such as gold or silver), to Fiat money (government sponsored and/or issued money) and bank-produced money (through the process of deposit and loaning). But no matter how money was originated and developed, its fundamental role should be to serve as the medium of trading. However, this fundamental role of money would entail some other functionalities of money.

In order to use money as the medium of trading, it must be commonly respected that the money has some nominal value which could be viewed as equivalent to wealth. As we know that the same T-shirt's manufactured by the same people in the same factory would have different market values with or without the tag of a famous brand sewed on it; similarly a computer disk of technical secrets could be worth much more than a disk without any data on it. This tells that the value of a product could vary depending upon the special social meanings attached to that product. *In this sense we could even view the nominal value of money, no matter presented as a piece of paper, a coin of metal or even a digital data as its real value guaranteed by the corresponding monetary system, which would vary according to the market situation just like the value of any artifact in the world.* This publically respected value of money would then entail another three functionalities of money. 1) Since money has value, making and saving money could be an alternative way of accumulating wealth; 2) Since accumulating money is equivalent to accumulating wealth, the amount of money possession could be considered as a measure of wealth, including the accessibility to potential material, cultural and social resources, of individual persons, families, or organizations. The amount of possession of internationally accepted hard currency could even be a measure of the wealth of a country; 3) the market values of goods and services could be measured using the units of money.

Very often many people including some politicians would show confusion about the significance of money itself and the circulation of money to social wealth when they compare the financial status of a government to the financial status of individuals. In fact, because of the conservation of money, even though the wealth of an individual person could be measured by the total amount of money in his bank account, for a society by and large, the velocity and efficiency of the circulation of money could be more meaningful for the general social wealth than the total amount of money issued by the government in the market. In the following subsection, I would illustrate the variation of social

wealth through the flow of money in the society by an anatomy of a small simplified economic system.

The dynamic meaning of social wealth

For simplicity in the discussion of this subsection, I would ignore the functionality of any financial institution, which would not affect the conclusion of this discussion. Suppose in a small community ABC there are three families A, B, and C; all their incomes are from outside the community. For the year N, the total income of family A was $140k, and both families B and C only made $5k for that year. Therefore, for the year N, the average income per household of the community ABC was (140+5+5) k÷3=50k dollar.

Now let's change the assumption we made in this example and assume that for the year N, in that community ABC, in addition to the $150k made from outside of the community, family B made $70k from family A by providing some important services to family A, and in order to do so family B purchased some materials from family C for $20k. Therefore, for the year N the average household income of community ABC would be (140+70+5+20+5) k÷3=240÷3=80k dollar, which means that the internal circulation of cash within the community ABC in the year N created $90k extra income for that community and brought the average household income up by $30k. At first glance this might not look meaningful since the overall income from outside the community was still $150k, and the extra $90k income was actually the cost of some families within that community.

Here we are facing the issue of how to interpret the meaning of wealth. The reason that money could be used as the measure of wealth is that money is the medium of trading; if money is no longer good for being the medium of trading then its value would be degraded into the value of a piece of paper or a coin of metal or even less. The real significance of trading is the changes of the world or life brought up through the trading. In the above example of community ABC, suppose that because of the service provided by family B the life of family A was substantially improved, the environment of the community became much better, the educational level of the kids was raised to a higher degree, and the competence of parents was increased remarkably so that they would be able to make much more from outside the community next year, and the life of both family B and family C was also improved greatly and they might even be able to make more money from outside than family next year, then how can we still say that the circulation of the $90k within the community ABC for the year N was meaningless?

This example also tells that the meaning of money to the wealth of a family is not exactly the same as the meaning of money to the wealth of a society. For a family, the more money in their bank account means the more material wealth they could acquire, while for a society even though the amount of available money is important, but it is the circulation of the money, instead of the total amount of the printed money that directly creates the social wealth. If the government issued billions of trillion units of base money, but there is no channel for the money to circulate (i.e. the channel for people to trade) within the society, the money would still not bring up extra wealth for the society. On the other hand, because of the international transactions, the possession of certain internationally recognizable hard currency could be viewed as the wealth of a country.

The impact of circulation channel and social environment

In last section I illustrated how the internal circulation of money could bring up wealth for the community ABC. That example might lead to another question, "how could we assure that the circulation of money among those three families would definitely bring up positive changes to their life and the environment of the community?" The answer is, "we cannot." In case family B was a single family of a professional killer and what family C sold to family B was the gun and ammunition, then the $90k circulation within the community ABC might not create any positive effect on the society; rather, it might drag those three families into deep troubles. As a matter of fact, the circulation of money only provides a mechanism that could mobilize the natural and social resources; as for how the natural and social resources would be used is quite a separate issue which is influenced by the global and community political and cultural environment. If the circulation of money in a community is completely used to harm others and damage the environment, then the circulation is creating disaster for the society instead of wealth.

Based upon the above discussion, we could actually see two of the fundamental factors for determining the efficiency and social effect of circulation of money: the channel of circulation and the political and cultural conditions of the society. In the above example of community ABC, if family B that could provide the service needed by family A did not live in that community and thus family A did not know family B, instead another family B' was living in the community as the neighbor of family A and they could not provide any service needed by family A, then we would not have had the circulation channel within the community ABC and thus the circulation mentioned in the example would never have happened. On the other hand, if the channel was very widely open between families A, B and C, but the product as the result of the flow was poisonous to the society then the outcome of the circulation in that community would have very negative impact to the society insides and outside that community.

Due to the simplification I made for the example of community ABC, especially because I did not take into consideration of any financial institution such as bank, many other complexities of economy would not be fully reflected. In real life the accumulated amount of money available for circulation, the loaning and credit mechanisms, money supply mechanism, government taxation and spending, and many other factors could affect the happenings, the effectiveness, and the social impact of trading tremendously. For instances, the role of the amount of money available for circulation would greatly increase the nonlinear complexity of the issue discussed here and one example is that sometimes the so-called dirty money (e.g., accumulated through unethical ways) could also be used to do good things; and the loaning and credit system could impose great risk to the macroscopic economy as well due to the broken credit chain.

Money Movement through Monetary Policy Operations

Similar to movement in hydrodynamics, as I mentioned earlier that, movement of money is also controlled by conservation law, constitutive relations, and initial and boundary conditions. One important approach to carry out monetary policy when there is the need to increase the money supply in the market is to inject money into the market (as the public often referred as "print money") through open market operations or operations like Quantitative Easing. From a dynamic point of view, no matter how money is injected into the market, they all share a common type of initial boundary condition: a large amount of money directly flows into very few financial entities which would help to spread the money into the market so as to boost the money circulation and the economy. However, the only physical reality is that the money gets into those few financial entities when this initial operation happens. Even though we might almost certain that

those financial entities would definitely spread the money out through loaning and other financial activities, as for how efficiently would these financial entities do this job to benefit boosting money circulation we could only make an assumption for the best and hope that they would do a good job.

The nature of this physical initial and boundary condition for the money movement through monetary policy operations determines that no matter how fair the mechanism of the operations would be designed, it would only benefit an inner circle of very few, and would count on an uncertain output of the work efficiency of those very few to make the operations successful in boosting money circulation in the market.

While the conservation law itself is homogeneous and isotropic, the constitutive relations could exhibit very discrepant nature across natural and social domains. Hydrodynamic flows in nature are driven by pressures acting on the fluid body while the physical spread of money is mainly caused by the attraction of interests. The flow under pressure has no other choice but gives its way to wherever the pressure pushes it to, but the attraction of interests could be vulnerable to many uncertainties even if the settings of apparent channels seem clear. As a result, it is much harder to predict the relationship between the amount of money injected into the market and the boosting effect of the injection upon the money circulation than the relationship between influx fluids at one entrance of hydraulic system and the boosting of the circulation of the flow within the system, unless more sophisticated work would be carried out to guide the flow of the cash. What monetary policy operations can do is to provide a initial boundary condition which might favor a higher velocity of money circulation; however, the fundamental principle of the constitutive rules of market economy is *pursuit of interests and exchange of needs* which could only indicate an economic relativity [3] that every single economic entity in the market would place their own benefit above the benefit of the general economy and thus does not indicate the best effect of the monetary policy upon the whole economy at all.

As a result, from the physical perspective, we might expect that, unless there is some more sophisticated market arrangement, the injected money through monetary policy operations might circulate only in certain layers in the highly stratified market, without reaching the far deep layers that stay far from the circle of interest of those large financial entities favored in the monetary policy operations for a long time. Of course, due to the diffusive nature of the money movement as mentioned earlier, continuous injection of large amount money into the market could finally affect the very deep bottom of the economic system at a risk of inflation. On the other hand, as the size of the market increases, there is a better chance for the injection of a large amount of money to boost the money circulation in a large enough range of the market without getting into inflation. This is because the rest of the market which is not directly affected by the injection could absorb the surplus money; therefore, in the end, the injection of the money could help boost the whole economy without dragging the market into inflation. In this sense, countries with hard currency circulating across multiple countries would have the advantage to inject a large amount of money but with less risk of getting into inflation.

Conclusion

Money is a fundamental element in the modern economy. For most people, what matters most with money as the very basic trading medium is its buying power or its market value. However, even though the buying power of money drives money to circulate in the market, the circulation itself, no matter what type of physical form it takes, still follows certain physical (or more precisely metaphysical) laws in contrast to the financial meaning of money. Awareness of these physical restrictions on the movement of money could help us better understand how money circulation could affect the economy and thus how the monetary policy would help the economy.

For a philosophical analysis, in this writing I have tried to avoid getting into technical details of monetary policy which would be a common place for pure economic discussions on the subject. The main goal of this writing is to lay out some basics for metaphysical analysis upon the physical nature of money circulation which would be meaningful for understanding the effect of monetary policy operations. Consequently, in this writing, attention has been focused only on one subset of the rich forms of monetary policy operations which are of clearer initial boundary conditions so that it would be easier for readers to comprehend the impact of the metaphysical conditions discussed in the writing.

References

1. Irving F (1922) The Purchasing Power of Money: Its Determination and Relation to Credit, Interest, and Crises. (2nd edn.), The Macmillan Co, New York, USA.
2. Hubbard RG, O'Brien AP (2017) Macroeconomics. (6th edn.), Prentice Hall, USA.
3. Dai R (2014) Chaotic Order: A Consequence of Economic Relativity. Complexity in Economics: Cutting Edge Research, pp: 117-135.
4. Braithwaite J (2015) An Introduction to Hydrodynamics and Astrophysical Magnetohydrodynamics. CreateSpace Independent Publishing Platform pp: 1-110.
5. Dai R (2014) Philosophical Analysis on Monetary Policy.
6. Amadeo K (2017) What Is Monetary Policy? Objectives, Types and Tools. US Economy.
7. Dimitrijevic B (2013) Essay on Monetary Policy and Economic Growth. Journal of Central Banking Theory and Practice.
8. Afonso JR, Araújo EC, Fajardo BG (2016) The role of fiscal and monetary policies in the Brazilian economy: Understanding recent institutional reforms and economic changes. The Quarterly Review of Economics and Finance 62: 41-55.
9. Loayza N, Schmidt-Hebbel K () Monetary Policy Functions and Transmission Mechanisms: An Overview. DEC Resources, pp: 1-20.
10. Clarida R, Gali J, Gertler M (2000) Monetary Policy Rules and Macroeconomic Stability: Evidence and Some Theory. Quarterly Journal of Economics 11: 147-180.