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Debt cancellation by the ECB. Does it make a difference?

The recent newspaper publications of a proposal made by more than 100 economists to cancel the government debt held by the European Central Bank has reignited the discussion about the role of the central bank in supporting the government. The question that many ask themselves is whether this proposal is to be taken seriously. In order to answer this question it is good to go to the basics of fiat money creation.

When the central bank buys government bonds, say in the context of QE, it substitutes interest bearing government bonds for monetary liabilities, (money base typically taking the form of bank reserves). In the old days these liabilities of the central bank were not remunerated. Since about 10 years, however, central banks have fallen victim to the lobbying by the banks and have started to remunerate these banks reserves. Nothing in the statutes of the central banks forces them to do so, and they could quickly reverse this policy. In fact, since a couple of years major central banks apply negative interest rates on these bank reserves, indicating how easy it is to reverse the remuneration policies.

At the moment when the central bank buys government bonds, it creates “seigniorage”. This is the monopoly profit arising from the creation of money. This “seigniorage” is transferred to the national government budget in the following way: the government pays interest to the central bank which now holds the bonds, but the central bank returns this interest revenue to the government. Thus, when the central bank buys the government bonds, de facto, the government does not have to pay interest any longer on its outstanding bonds held by the central bank. The central bank’s purchase of government bonds is therefore equivalent to debt relief granted to the government.

What happens when the government debt held by the central banks is explicitly cancelled? I will argue that economically nothing of substance happens.

As long as the government bonds are on the balance sheet of the ECB bonds do not exist anymore from an economic point of view. This is so because, as I argued earlier, when a government bond is on the central bank's balance sheet, a circular flow of interest payments is organized from the national treasury to the central bank and back to the treasury. So, the burden of the debt for the national government has become zero. The central bank can cancel that debt (i.e. set the value equal to zero) thereby stopping the circular flow of interest payment. This would not make a difference for the burden of the debt. Put differently, the profit of the money creation has been transferred to the government at the moment of the purchase of the bonds by the central banks.

What happens when the bonds that are kept on the balance sheet of the central bank come to maturity? The ECB has promised that it would buy new bonds to replace those that come to maturity. Again, no difference with outright cancellation. Thus, as long as the government bonds remain on the balance sheet of the central bank it does not make a difference from an economic point of view at what value these bonds are recorded on the balance sheet of the central bank. These can be recorded at their face value, their market value ,or they can be given a value of zero (debt cancellation): from an economic view this does not matter because the government bonds on the balance sheet of the central bank cease to exist.

What matters is the size of liabilities of the central bank. This is the money base that has been created when the bonds were purchased. As long as the money base is kept unchanged, the value given to the government bonds on the balance sheet of the central bank has no economic consequence. If these bonds were to be set equal to zero (so-called debt cancellation) the counterpart on the liabilities side of the central bank would be a decline in equity (possibly becoming negative). But again, this is of no economic consequence. A central bank issuing fiat money does not need equity. The value of equity on the books of a central bank only has an accounting existence.

Thus, debt cancellation is fine, but it is equivalent to no-debt cancellation as long as the bonds are held on the balance sheet of the central bank. The problem may arise in the future if inflation surges and if the ECB wants to prevent the inflation rate from exceeding 2%. In that case it will have to sell the bonds, so as to reduce the money base (and ultimately the money stock). If the bonds are still on the balance sheet (because they have not been cancelled) the central bank will sell these. As a result, they will be held by the private sector and the burden of the debt of the governments will increase because the interest paid on the bonds will go to private holders who do not return it to the treasuries.

If the bonds have been cancelled they cannot be sold anymore and the central bank will have to reduce the money basein another way. It could issue its own interest-bearing bonds in exchange for the outstanding money base. But this means that the central bank will have to pay interest in the future. As a result, it would transfer less profit to the treasuries. Again, no (or little) difference with outright cancellation.

The conclusion here is that if the ECB wants to keep inflation at 2% it does not make a difference whether it cancels the debt or not today. In that case if the inflation surges beyond 2%, it will have to reduce the amount of outstanding money base by either selling government bonds or issuing its own interest bearing bonds, thereby taking back the seigniorage it granted to the government when it bought the bonds.

Things would be different if the ECB were to allow more inflation in the future; in other words if it decided that it will do nothing when the inflation exceeds 2%. Then it would not have to sell the bonds (or issue its own bonds). In that case, the higher inflation would

reduce the real value of the government debt that is not on the balance sheet of the central bank, and that was issued during the last few years at very low interest rates. The government would gain. But note again that this gain would accrue to the government whether or not the debt was cancelled.

Who would pay for this inflationary policy? The investors. Nominal interest rates would increase, thereby reducing the price of the long-term bonds that these investors were foolish enough to buy at negative or zero interest rates.

Two last comments. First, the 100 plus economists proposing debt cancellation have created the illusion that debt cancellation reduces the debt and therefore allows governments, unburdened by old debt, to issue new debt to finance great projects. I have argued that the debt relief occurs at the moment of the bond purchases by the central bank and not when the central bank puts the value of these bonds equal to zero on its balance sheet. The illusion is to think that you can have debt relief of the same debt twice.

Second, except if at the moment of the debt cancellation governments force the ECB to cancel its commitment to an inflation target of 2%, the future increases of inflation will necessarily force the ECB to reduce the amount of money base thereby undoing the debt relief it organized when it bought the debt. Thus, as long as the ECB remains committed to its inflation target, explicit debt cancellation is likely to only reduce the debt burden temporarily. Only if the ECB reneges on its inflation commitment will debt cancellation permanently lower the government debt burden. But somebody will then pay for the inflation tax. One may still argue, however, that some more inflation is worth the price for permanently reducing the government's debt burden. Maybe this is what the 100-plus economists had in mind.

How to trade when countries insist on sovereignty

The UK government has become entrenched in its demand for full sovereignty. Rules about safety, the environment, health, workers' rights, and state subsidies shall be made in Westminster without any interference from Brussels. The UK government insists on the right to diverge from the rules that exist in the internal market. No doubt, that is what sovereignty means. At the same time, however, the UK government also wants to maintain access to the EU internal market under these UK made rules. To use the chicken example: The UK government wants to have the right to decide what the sanitary rules will be for their chickens (for example, they can be washed in chlorine) and at the same time the right to sell those chickens in the EU.

The problem with this view is that the EU also is sovereign and therefore has the right to impose tariffs on the import of unwelcome chicken. How can trade be made to work when two partners in a trade deal claim full sovereignty?

Here is how a full sovereignty model could work. Full sovereignty has two implications. First, it means that each of the two countries decide independently about the laws that will apply in their lands. Thus, all firms (including EU firms) selling in the UK comply to UK laws. Similarly, all firms (including UK firms) selling in the EU comply to EU law.

A second implication of full sovereignty is that each of these two countries decide independently how they will control compliance within their own borders. Firms that do not comply are sanctioned and each country is free to decide about the nature of these sanctions (barring sales, tariffs, etc.). Thus, UK firms selling goods in the EU that do not comply to EU law face these sanctions decided by the EU. The same holds for EU firms selling in the UK.

Such a trade deal based on full sovereignty would actually be easy to reach quickly. In a full sovereignty model there is no need for complicated joint committees that after long negotiations will have to identify the degree to which rules and regulations in both countries diverge. No need for setting up complicated procedures for settling disputes when divergence is observed. Such committees take a long time to come to decisions. They are time bombs leading to permanent conflicts between the trading partners. Thus, a trade deal based on full sovereignty would be easy to arrive at; it would also be relatively easy to govern in the future, as each country keeps its sovereign power to identify rule divergence and to sanction it.

Once such a deal is agreed upon, it would be difficult if not impossible, to avoid an asymmetric future development. This asymmetry follows from the fact that the EU internal market is the biggest in the world and much bigger than the UK market. This will lead to what is known as the “Brussels effect”. UK firms will eagerly comply to the EU rules so as to be able to sell in the largest single market in the world. Not doing so, would be punished by the EU and would lead to large losses for many UK firms. For EU-firms the UK market is small and, therefore, being excluded from that market would not be a loss comparable to what UK firms loose when excluded from the EU internal market.

This asymmetry will put great pressure on future UK governments to align their laws on EU laws. Of course, the UK government could initially resist this. This, however, would put UK firms at a competitive disadvantage. They would have to produce for the UK market under UK rules and for the EU market under EU rules. This would raise their production costs. Over time pressure from the UK business sector on the UK government would very likely lead the latter to align its legislation to the EU one. There is no need to try to impose this today. It will come about automatically.

The previous discussion makes clear that the trade model based on full sovereignty is an evolutionary one. It may ultimately lead to free trade. This will happen when one of the two trading partners, in this case the UK, will recognize that it is futile to continue to pursue full sovereignty. It also shows that free trade can only be achieved if one of the two partners recognizes this. Note that the other partner, in this case the EU, can continue to enjoy full sovereignty and free trade. This “exorbitant privilege” comes from the fact that the EU is by far the larger partner, and thus becomes the rule-maker. This happens as a

result of system competition. Firms realize that it is in their interest to take over the rules prevailing in the EU, and then pressure their governments to do likewise. At the end of that tunnel free trade emerges.

Green money without inflation

To what extent can the money created by the central bank be used to finance investments in the environment? This is a question that is often asked today. The green activists respond with enthusiasm that the central bank, and in particular the European Central Bank (ECB), should act and stimulate the financing of environmental investments through the printing of money. The ECB has created 2,600 billion euros of new money since 2015 in the context of its quantitative easing (QE) program. All that money has gone to financial institutions that have done very little with it. Why can't the ECB inject the money into environmental investments instead of pouring it into the financial sector? Most traditional economists react with horror. The ECB should not interfere with the environment, they say. The government should do that. If the ECB jumps on the environmental bandwagon, it will be obliged to print too much money. This will fuel inflation in the long run, with terrible consequences. Ultimately, the environment will not be served.

Who is right in this debate? To answer that question, it is good to recall the basics of money creation by the ECB (or any modern central bank). Money is created by the ECB when that institution buys financial assets in the market. The suppliers of these assets are financial institutions. These then obtain a deposit in euros at the ECB in exchange for relinquishing these financial assets. That is the moment when money is created. This money (deposits) can then be used as their reserve base by the financial institutions to extend loans to companies and households.

There is no limit to the amount of financial assets that the ECB can buy. In principle, the ECB could purchase all existing financial assets (all bonds and shares, for example), but that would increase the money supply in such a way that inflation would increase dramatically. In other words, the value of the money issued by the ECB would fall sharply. To avoid this, the ECB has set a limit: it promises not to let inflation rise above 2%. That imposes a constraint on the amount of money that the ECB can create. So far, the ECB has been successful in maintaining the 2% inflation target.

There is also no restriction on what types of assets the ECB can buy. Since 2015 when it started its QE-program, the ECB has mainly bought government bonds, but also corporate bonds from financial institutions. The ECB could, however, also purchase bonds issued to finance environmental investments. The only restriction on these purchases (again) is that they do not endanger the 2% inflation target.

What are the options for the ECB? The ECB has bought 2,600 billion of government and corporate bonds since 2015. These purchases have not fueled inflation, which has remained below 2% in the Eurozone. The ECB has now stopped making new purchases. It has announced though that when these government and corporate bonds come to maturity, new bonds will be bought in the market so as to keep the money stock (money base) unchanged. This creates a "window of opportunities" for the ECB. It could replace the old bonds with new "environmental bonds", i.e. bonds that have been issued to finance environmental projects. In doing so, the ECB would not create new money. It

would only reorient money flows towards environmental projects. As the total amount of money would remain the same there would be no risk of additional inflation..
A possible objection is the following. If the ECB buys these "environmental bonds", it will be involved in the decision-making process about which environmental investments should have a priority. For example it would have to answer questions such as: How much public and private investments must be made? Should it be renewable energy or nuclear energy? Should the priority be given to public transport? These are all questions that have to be settled by political authorities, and not by the central bank.
One possible way out: The European authorities give a mandate to the European Investment Bank (EIB) to finance, for example, 1000 billion of environmental investments. These political authorities add guidelines for the EIB about environmental priorities. The EIB issues bonds to obtain the resources necessary to fund these investments. This is the moment the ECB can step in by buying the EIB-bonds at a pace dictated by the expiration of the old bonds on its balance sheet. This way the ECB creates "green money" without fueling inflation. At the same time, as the ECB buys EIB bonds, it creates the possibility for the EIB to increase its borrowing in the capital markets without endangering its AAA-status.
The bottom line is that it is perfectly possible for the ECB to use the instrument of money creation to favour environmental investments without endangering price stability. Of course, one could also argue that the ECB could use its monetary instrument to favour other worthwhile projects, e.g. poverty reduction. This is certainly true, and if a majority of the population were to desire this, it should be done. Nevertheless, I am rather reluctant to go in this direction, as it would create the risk that the ECB is loaded with too many social responsibilities that it cannot handle properly.
That's why I conclude that given the existential nature of the degradation of the environment, including climate change, the priority should be to use the ECB's money creation capacity towards the support of environmental projects. This can be done without creating inflation.

Who should pay for the cost of climate policies?

There should be little doubt that drastic measures are required to protect the planet from environmental catastrophes. But who should pay the bill for these urgent environmental policies? This is the question that is central today and that was placed on the political agenda recently by the "yellow vests" protestations. Many want to save the environment but few want to bear the cost. Yet without resolving this question of who will foot the bill no progress can be made in developing effective climate policies.
The problem exists at two levels. There is the question on which shoulders of the *current* generation the greatest burden will be placed. There is also the question of how the costs will be spread between current and future generations.
The first question is receiving most of the attention today. It is indeed important to design redistributive policies that will ensure that those with the "strongest shoulders" bear a proportionally larger part of the cost of climate policies. This could be achieved by transferring the whole (or part) of the proceeds from the taxes on fossil fuels to those in the lower income brackets. It appears that although this simple principle is easy to formulate, the political conflicts that arise when one wants to apply it are intense.

The second distributional question, the one between the present and future generations is of equal importance. This is the one I want to address here. When we impose extra taxes on households and businesses today to finance environmental policies, we actually ask them to pay the full cost of a policy that will benefit the future generations. Many people resist this today, and then rationalize this resistance by denying the urgency of climate change. It is therefore important to set out a policy that ensures that the costs are spread between current and future generations in such a way that the distribution of these costs also reflects the distribution of the benefits over time.

There is one policy domain where we can actually apply this distributional rule, and that is public investment. The latter, together with private investments, are essential to transform the economy from the use of fossil fuels to renewable energy sources. Public investments must be made in new energy infrastructure, in public transport, in research and development, and in many other areas.

The formula that achieves the objective of spreading the costs over time is to finance public investment through the issuance of government bonds. The issue of bonds today provides the financing for the investment project while the payment of interest costs is spread over time. Thus, such a financing distributes the costs of the investment between present and future generations. The latter will enjoy most of the benefits of those investments and will also contribute to their costs. Such a financing also makes it possible for the current generation to be partially relieved of the costs of these investments. This reduces the resistance to costly environmental policies.

Unfortunately the European authorities have put sticks in the wheels. The budgetary rules imposed today by the European Commission prevent the costs of public investment from being spread over time. The rule that the government budget must be (structurally) in balance makes it impossible for public investment to be financed through the issuance of bonds. The reason is that the latter creates a structural deficit in the budget and that is forbidden by the fiscal rule.

The consequence is that when Eurozone governments want to make environmental investments, they are obliged to increase taxes and/or to reduce other government expenditures (e.g. social security). In other words, they are obliged to force 100% of the costs of these investments to be paid by today’s households and firms. And quite naturally, these resist and rightly so.

The solution to this problem is actually very simple and is sometimes called the “golden rule”. The European authorities should allow public investments to be put into a "capital budget". These may be financed through the issuance of bonds. The European rule of structural balance would then only apply to the ordinary budget consisting of current spending and taxes. Since current spending represents more than 95% of the total budget in most European countries, this would ensure that more than 95% of the budget would be subject to the balanced budget rule.

The only thing that stands in the way of this solution is the dogma that government debt is always bad. Public debt is indeed bad when it serves to finance consumption. Public debt is good when it serves to make productive investments that help keeping the planet safe from future environmental catastrophes.

The problem with the dogma that government debt is always bad is that it originates from an obsession that only looks at the liabilities side of the balance sheets of governments.

We would never do this when we want to evaluate the financial health of private companies. We would always look at both the asset and liabilities sides to make a judgment about the solvency of these companies. Yet when we make such a judgment about a government we close our eyes for the asset side of its balance sheet; a wholly irrational procedure. When the counterpart of the higher government debt consists of productive assets whose returns exceed the cost of the debt, there is no problem of raising this debt. The debt can then permanently exceed 60%, or 100% for that matter. It then makes no sense for the European Commission to desperately trying to force public debts into unconditional surrender.
It is time we shed the dogma that government debt is always bad. We have to shed this dogma to make it possible to massively invest in projects that will prevent climate change from destroying the planet. Such investments can only be made if the costs are shared by current and future generations.

The European Commission should accept democratic change in Italy

The Italian budgetary and financial crisis is getting worse. The conflict between the Italian government and the European Commission on the proposed budget is intensifying. It does not seem likely that the Italian government will yield to the demands of the Commission to adjust the budget. This conflict leads investors to continuing to sell Italian government bonds leading to a surge of the yields on these bonds. It has become the major source of upheaval in the Italian government bond market and risks escalating into a full-fledged crisis of the Eurozone.
Time to think again about the budgetary rules that are being applied by the European Commission.
Since the Eurozone's debt crisis in 2010, the European Commission has seen a dramatic increase in its power to supervise and control national budgets. This development was motivated by the will of the creditor countries to impose budgetary discipline on the debtor countries, such as Greece, Ireland, Spain and Portugal. As a result, the Stability and Growth Pact was strengthened and the power of the European Commission over the budgetary process of the euro zone member states was tightened.
The new responsibilities of the European Commission create a problem of democratic legitimacy. Not in the sense that the Commission's tighter role in the budgetary procedures of the Member States have been achieved in an undemocratic manner. This increased power of the Commission is the result of decisions in the Council of Ministers and in the European Parliament. These are bodies that have been established in a democratic manner and that have decided to give the European Commission more power over national budgetary procedures after applying the majority rule. Formally there is nothing wrong with the legitimacy of the European Commission.
However, I am talking here about political legitimacy. The European Commission can now force countries to increase taxes and reduce expenditures without, however, having to bear the political costs of these decisions. These costs are borne by national governments. This is a model that does not work.
National governments bear the political costs of expenditures and taxes. The risk therefore arises that they will contest the decisions of non-elected officials who do not bear these costs. This has happened a few times in the past. In 2003-04, when their

economies were not doing well, the German and French governments collided with the European Commission about their budgets. The European Commission wanted to force these governments to reduce their budget deficits. Both governments refused to do this and the rules were changed "à la tête du client".
Today the Italian government is doing the same. It is a government that has made a number of election promises and wants to implement them now. That has budgetary implications. The European Commission is now trying to force the Italian government to abandon these election promises without having to bear the political cost of doing so. The new Italian government would pay the political price for shredding its election promises. It will not do so, as the French and German governments did not do in 2003-04.
The model of top-down budgetary control does not work in Europe. It does not work because the whole process of decisions on taxes and expenditures still exists at the national level. It is also at the national level that the democratic principle of "no taxation without representation" is implemented. The European Commission's attempts to bring Italy into line today are therefore also attempts to impose exceptions to this democratic principle. It does not work, and fortunately so.
The only way out of this institutional crisis is to go further into political unification. This implies that large parts of the national budget processes would be transferred to the European Parliament. The principle of no taxation without representation would then be applied at the European level. This would raise the democratic legitimacy of the budgetary process to a higher European level.
We are very far from such a political unification today. This means that, at regular intervals, democratically elected national governments will reject the European Commission's attempts to go counter the will of the electorate.
One would hope that the European Commission understands this quandary and that it takes a flexible position, allowing the Italian government to have its budget deficit of 2.6%. It would be a bow of the Commission to the outcome of a democratic change in Italy. It would also take away a major source of upheaval in the Italian government bond market, and the risk that this entails for the Eurozone as a whole.

Why Russia is politically and militarily strong while being an economic dwarf

Last week I saw a surprising statistic: the GDP of Russia is of the same order of magnitude as the combined GDP of Belgium and the Netherlands. In 2017 Russian GDP was 1,469 billion dollars (according to the International Monetary Fund). Belgium had a GDP of 491 billion dollars and the Netherlands 824 billion dollars; together $ 1,315 billion. In GDP terms, Russia is only 12% larger than Belgium plus the Netherlands.
This perplexing statistic prompted me to ask why politically Russia weighs so much more in the world than Belgium and the Netherlands, while economically that country is hardly stronger than these two countries bordering the North Sea.
Before answering that question, first some other figures that illustrate how an economic lightweight Russia is. US GDP reached USD 19,362 billion in 2017. With GDP as a yardstick, the US is 13 times bigger than Russia. In the same way, other countries can be compared with Russia. China is economically 8 times larger than Russia; Germany 2.5

times more, France 1.8 more, and the European Union as a whole is 12 times bigger than Russia.
The economic size of a country is one of the most important factors that determines its military and political importance in the world. A large economy is needed to provide the means that gives the country military and political weight in the world. So it is clear: Russia is boxing above its economic weight on the international scene.
The fact that Russia means so little economically implies that the country must exert extraordinary efforts to create a strong military potential. In 2017, Russian military spending amounted to 61 billion dollars (according to the International Institute of Strategic Studies). The US spent nearly 10 times more, namely $ 603 billion. China spent $ 151 billion on defense. France and Germany together spent 90 billion dollars on defense, 50% more than Russia. And yet all these countries spent a much smaller proportion of their GDP on the military than Russia.
Russia is not a major player in the field of military spending. To have a certain military weight, that country must reserve a much larger share of its GDP for defense than the other countries. To mean something militarily, Russia has to put a heavy burden on its own economy.
I come back to my question: why is it that Russia, which economically is a lightweight, has such an importance politically and militarily? Here is an attempt to answer that question.
First there is the fact that, at the time of the Soviet empire, Russia built up a nuclear arsenal that, together with the USA, gives this country a unique position in the world. This is the position of "Mutually Assured Destruction" (MAD). This means that the country has the capacity to completely destroy the opponent in the event of a nuclear attack on its own territory. No other nuclear power (outside the US) has that capacity today. As long as Russia has such a terrible MAD capacity, it will be politically heavier than its GDP suggests.
Russia is also an important supplier of raw materials, including oil and gas. This gives the country a political lever with regard to Western Europe. It is possible by turning the tap (or threatening to do so) to exert pressure on a number of European countries. However, that effect should not be overestimated. Russia also knows that the use of this weapon will in time encourage European countries to find other sources of supply. The power of Russia is limited in this domain because the country does not have a monopoly in oil and gas.
Finally, and that is my most important point, Russia is powerful because Europe grants that power to Russia. Europe has built up an economic union but not a defense union. The European Union is economically 12 times larger than Russia; A huge potential power. However, this economic power is not converted into military and political power because defense has remained a national matter. By merging their military capabilities, it would be possible for France and Germany to build a credible defense against Russian threats, without having to spend more. The combined military spending of such a Franco-German defense union would be 50% higher than Russian military spending. Enough to offer a counterweight to a Russian dictator whose political and military ambitions in Europe remain unknown.

"Si vis pacem, para bellum" said the Romans. If you want peace, you should prepare the war. Translated to the European situation of today this means that Europe should build a credible defense union. This by itself would reduce the military and political power of Russia.

The bitcoin is not the currency of the future

There seems to be no end in sight for the bitcoin bubble. This comes close to the great bubble developments that we have known in history, including the tulip bulb bubble in sixteenth century Holland, the South Sea bubble in the eighteenth century, and many others. These bubbles and today's bitcoin bubble are always driven by an excessive optimism about the value of some asset and an expectation that the price of that asset will continue to rise in the distant future. But each time these bubbles came to an end and the prices collapsed.

The expectation that the price of bitcoins will continue to rise in the distant future has a lot to do with the belief of many people that the bitcoin, and other "cryptocurrencies", are the money of the future. Nothing could be farther from the truth. In fact, the bitcoin is an archaic currency like gold used to be. Archaic currencies are created by using scarce production factors. Gold had to be digged deep in the ground by using a lot of labor and machinery. Keynes called gold an "barbaric relic".

The same can be said of the bitcoin. Bitcoins are made ("mined" as it is called in the bitcoin terminology by analogy with gold) by using large amounts of computing power. The computers needed to mine bitcoins use a lot of electricity and thus large amounts of scarce energy sources (crude oil, coal nuclear energy, renewable energy sources). According to some estimates, the energy needed to produce bitcoins for one year is equivalent to the energy consumption of a country like Denmark. A phenomenal cost, if we also take into account the external costs, such as the CO_2 emissions, associated with the production of electricity.

Although the bitcoin is perceived as the currency of the future, it is in fact, like gold, a currency of the past. The contrast with modern money is striking. Modern money is also called "fiat money" because it is made from nothing. Of course, the production of paper money costs a lot, but we use less and less of it. Instead we use more and more electronic money by making payments with debit and credit cards. Electronic money is produced with minimal use of scarce resources. As the cost of communication continues to decrease, the use of electronic money will become even cheaper in terms of resources needed to produce it. In this sense electronic money, not bitcoin, is the money of the future.

It is possible that technological innovations lead to a further decline in the resource cost of mining bitcoins. But surely, today the handicap of bitcoins in providing a resource-cheap-form of money compares very badly with the existing forms of electronic money that can be produced with small fractions of the cost of bitcoins.

There are, however, other and possibly more serious reasons why bitcoins and other cryptocurrencies have no future as means of payments and units of account, the two essential functions of money. First, as the supply of bitcoins is fixed asymptotically, its generalized use as a means of payment would lead to permanent deflation (negative inflation). The reason is that the world economy is growing and in need of an increasing

supply of money to make growing transactions possible. The only way this can be dealt with in a bitcoin economy is by declining bitcoin prices of goods and services, i.e. negative inflation. The quantity theory of money tells us that it could also be dealt with by increasing the velocity with which bitcoins are used, but there is a limit to that possibility. Thus a bitcoin economy would face permanent deflation, not a very attractive situation. Capitalism is based on entrepreneurs taking risky initiatives. These entrepreneurs are usually of the optimistic type. They expect increasing sales in the future. It is the optimism that drives the dynamics of capitalism. In a bitcoin economy where prices are declining every year this optimism is negatively affected. Price declines lead consumers to postpone their purchases and investors to postpone their projects. It is a world with less optimism and probably less growth.

In order to avoid this problem, cryptocurrencies should provide for a protocol that allows the supply of these currencies to increase in the steady state. A rule à la Friedman where the supply of the currency is subject to a constant yearly growth rate would do the trick. This is not the case of the bitcoin, making this cryptocurrency particularly unfit to function as the money of the future.

There is a second and even more serious reason why the bitcoin is not suitable as a currency. In fact it would be a dangerous currency. If the world turns to bitcoins, banks will start lending bitcoins to households and firms in need of credit. But banking is a risky business. The problem is that as the supply of bitcoins will be fixed, there will be no lender of last (LoLR) support in times of banking crises. And these are certain to occur. Even if the supply of bitcoins or of other cryptocurrencies could be subjected to a constant Friedman growth rule it would not solve this problem.

The LoLR support presupposes that the central banks can create money out of nothing. In a monetary system where the stock of money is fixed (or growing at a constant rate), there is no such LoLR possible. This leads to the prospect of regular banking crises that will lead to failing banks and further negative domino effects on the economy. This is exactly what we observed during the heydays of the gold standard, which was characterized by frequent banking crises leading to deep recessions and much misery. Again, the bitcoin standard, like the gold standard, is something of the past, not of the future.

More generally, the problem of a bitcoin economy is that in times of financial crisis, which one can be sure will arise again, there is a generalized flight into liquidity. That's when a central bank is needed to provide all the liquidity needed. In its absence, individuals scrambling for liquidity sell assets, leading to asset deflation and insolvency of many. A bitcoin economy does not have this flexibility and therefore will not withstand financial crises. A bitcoin economy will not last in a capitalistic system, which regularly generates financial crises.

Today the bitcoin bubble is sustained by the belief that this cryptocurrency has intrinsic value; a value that derives from the belief that it is the money of the future which in addition will be available in limited quantities. When enough people come to the realization that bitcoins and other cryptocurrencies have no future as means of payments, it will be clear that the bitcoin has no intrinsic value, that the "emperor has no clothes". Then the bitcoin bubble will burst and there will be a lot of handwringing of the speculators who have stepped into the bubble too late.

All this does not mean that the blockchain technology used in cryptocurrencies may not have other important applications. For example, the storage of large data using blockchain technology will make it possible to do so in a decentralized way, opening up a vast array of new applications. The current design of the bitcoin, however, makes it unsuitable as a currency for the future.

The idea that the bitcoin is the currency of the future is very popular with market fundamentalists. These are wildly enthusiastic about the bitcoin because it is created entirely outside the control of central banks. The latter are seen as the source of much evil. The fiat money they create will, according to those fundamentalists, lead to hyperinflation and other disasters.

There is indeed a potential problem with fiat money. Because its production is so cheap, there is the danger that too much of it is produced. That then leads to inflation. However, since the 1990s, many central banks have followed a policy of strict inflation targeting. And that has proved very successful. It has ensured that annual inflation has remained close to 2 percent in the last 30 years in most industrialized countries. In the US, for example, average yearly inflation was 2.35% from 1990 to 2017.

That will not convince the market fundamentalists. They continue to believe that the moment of hyperinflation has yet to come. In addition, for many of them bitcoin has become the symbol of a free market world. A world in which markets unhampered by government controls create great wealth for many. It is also a world in which markets have self-regulating features that prevent financial crises from occurring. Indeed in such a fictional world the bitcoin would provide the anchor of stability. Not in the real world.