

Yves Mersch: Monetary policy and time inconsistency in an uncertain environment

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1 Time inconsistency and policy

1.1 About time inconsistency

On October 11, 2004 Fynn Kydland and Edward Prescott were rewarded the "Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel". One of the reasons for granting them the so-called "Nobel-prize in economics", was that they enriched the economics profession with an insight that was to change the thinking about economic policy. At first, their research was meant to merely shed some light on the execution of control theory in dynamic systems. All of a sudden, however, they ran into a problem, which although seemingly harmless, was to direct their work into a completely unexpected direction. They discovered the power of expectations in a policy planning framework.

In the late 1960s, the role of expectations was investigated thoroughly and they were found to be important variables, which may determine economic outcomes. Academics like Milton Friedman and Edmund Phelps strongly contributed to this line of research in the framework of monetary policy. Later Robert Lucas introduced the concept of "rational" expectations. According to this concept, individuals form their expectations rationally, using all information available to them. The information includes the functioning of the economy, the objectives of the government and all other relevant variables. This concept implies that a government (or the monetary authority) cannot systematically betray market participants by pretending to follow a certain policy and subsequently acting differently.

Using this argument, Kydland and Prescott included government behaviour in their model and assumed that individuals form rational expectations. They showed that even if the government and its citizens pursue the same objectives, i.e. maximising the welfare of the population, discretionary policy is subject to a fundamental time consistency problem. The fundamental problem is that a government policy that is optimal at a certain point in time may not be optimal later on. Since individuals form rational expectations, they realize that the government has this incentive to deviate from its previously announced policy, and behave accordingly.

The point is that the population's expectations put an extra constraint on government policy and so if the government has an incentive to deviate, consistent policy will not be optimal and an optimal policy will not be time consistent. If, for example, the government chooses the policy optimal at a certain point in time, it does not take into account the expectations previously formed by the private sector. Since the private sector did take some economic decisions based upon these expectations, the government policy is not time consistent. On the contrary, if the government were to follow a time consistent policy, this would not be optimal. To illustrate this theory, Kydland and Prescott used some very accessible examples such as the following.

Imagine a flood plain in which the government does not want its citizens to build their houses because it would have to construct dams in order to protect the houses. If there were houses in this plain, however, it would be optimal for the government to construct dams to protect its citizens. Consequently, if rational agents are certain that the government is not going to build dams to protect the plain, they will not build houses, which would be the best outcome for the economy as a whole. On the other hand, since the citizens know that, once the houses are there, the optimal choice for the government is to construct the dams and hence rational citizens will build houses in the flood plain.

Now, what is the solution to this time inconsistency problem? The only solution can be summarized in one single word: commitment. Commitment in this case means that the government abandons control over certain policy options in order to credibly communicate to its subjects that policy is not going to be changed in the future. In the above example, if the government could enact a law that prohibits it from constructing dams in the flood plain, implying that the decision on dams would no longer be in its hands, citizens would not expect the government to change its mind and consequently they would not build their houses in the flood plain.

Whenever a time consistency problem arises, policy rules of some kind are clearly superior to discretionary policy. Policy rules can be understood as any mechanism that helps the government to credibly commit to a certain policy and which prevents it from changing its mind later on.

In the domain of monetary economics, the issue of policy rules was picked up in the late 1980s. Most important was the work of Bennet McCallum but also of John Taylor who introduced the famous "Taylor rule".

Bounded discretion versus explicit policy rules

The idea behind rules is to give up the discretionary influence that policy makers have upon monetary policy. This is to make credible that monetary policy only depends upon the predetermined factors that are included in the rule. Since economic agents can cross check the results, credibility can easily be achieved. Another advantage of rules is the ease with which the public can determine its expectations. Under a regime led by rules, at least some if not all elements that guide monetary policy are observable and thus agents can derive future monetary policy by means of the rule.

But policy rules do have important drawbacks, which in the end are the reason why they are never used in practice as a guide for the conduct of monetary policy. John Taylor himself notes it in his famous 1993 article that "[...] operating the rule requires judgement and cannot be done by the computer". What he means is that policy rules have the disadvantage of being inflexible. Since a rule must include some variables at the expense of others, it is obviously ill-prepared to unforeseen shocks that affect the economy. For example some demand shocks might require a quick response by the monetary authority in order to guarantee price stability.

A solution to this problem consists in using a broader definition of a policy rule. Taylor gives the example of patent laws. If an inventor obtains a patent, he has the right to exploit a certain principle for a couple of years. The details of the invention are not subject to the patent. In a similar way, a policy rule can be understood as a set of objectives and targets subject to which the monetary authority takes its decisions. In this sense, bounded discretion is a systematic collection of discretionary policy actions which, while leaving the flexibility to react to unforeseen events, offers the credibility and purposefulness of a rule.

1.2 Time inconsistency and policy

There are hardly any scientific publications in economics that had as important an impact on day-to-day policy-making as the contribution of Kydland and Prescott. Soon after identifying the inherent time inconsistency problem of optimal policy plans with rational expectations, similar problems were discovered in many areas of economic policy. The most important and influential ones were the time inconsistency problems concerning capital taxation in fiscal policy and the output inflation trade-off in monetary policy. Although both problems reside in different domains of public policy the core of both remains the same. In addition to dealing with these, I will also review a peculiar kind of time inconsistency related to fiscal sustainability.

1.2.1 Fiscal policy

One important finding in the domain of public finance is the Ramsey principle of optimal factor income taxation. Developed in 1927 by the economist Frank Ramsey, it asserts that the input factor with the lowest elasticity of substitution should be taxed most. In order to keep the distortionary effects of taxation as moderate as possible, those factors that react least to taxation should be taxed most.

Since the savings of today are the capital stock of tomorrow, a problem of time inconsistency arises in capital taxation. In order to promote savings and assure the capital stock of tomorrow, the government has to be wary of the elasticity of substitution of capital. That is to say, the government must account for the relatively high mobility of capital. This implies setting a low tax rate on capital income.

Ex-post however, once capital is installed, its mobility drops to zero. Applying the same Ramsey principle then, implies taxing capital at 100 %. Of course rational individuals would anticipate this outcome, and not save in the first place. Again the government needs a commitment mechanism that helps it to credibly communicate that it won't change its mind. In this case, reputation serves in part as such a mechanism.

Besides the Ramsey principle, time inconsistency could feed through to another avenue in public finance. At a given point in time, governments could be tempted to depart from the optimal strategy,

i.e. fiscal soundness. They could, for instance, increase public expenditure in order to accommodate the demands of the median voter or specific constituencies. This move would of course result in higher deficits and therefore future taxes. However, governments are in a position to conceal this uncomfortable message over the short or even the medium term, at least if the "rational expectations" assumption is relaxed. First, it could make overly optimistic macroeconomic projections in order to hide the challenge to fiscal sustainability. Second, it could throw a veil of mist on this problem by capitalising on the uncertainty inherent in the definition and measurement of sustainability, especially over a long-term horizon.

In many cases, the "true state of the world" will be disclosed well after the government responsible for higher expenditure has departed. This form of time inconsistency is quite peculiar and distinct from the concept I referred to so far. In the latter, as already said, the government might "betray" the citizens by pretending to follow a certain policy and by acting differently *ex post*. In the current, "peculiar" form of the concept, the government would confuse the citizens *ex ante* by pretending to follow a rigorous fiscal policy. The "true state of the world" would manifest itself through higher deficits or other breaches of sustainability, probably when it would be too late to address this challenge in an efficient way. The government does not renege on its promises in an active way, through the implementation of new, explicit measures, but it distorts *ex ante* the "true state of the world".

Two commitment mechanisms could mitigate this peculiar kind of time inconsistency. First, independent budgetary institutions could be set up. They would endeavour to lift the veil of uncertainty, for instance by conducting independent macroeconomic projections. These projections could be the cornerstone of the elaboration of general government budgets (central government, social security, State and local governments). Independent institutions could also be in charge of measuring and monitoring fiscal sustainability based on long-term projections. Such institutions are already in place in many countries, in particular in small, open economies. Let me mention as examples Belgium (High Council of Finance), The Netherlands (the Central Planning Bureau provides independent macroeconomic and budgetary forecasts), Denmark (Economic Council) and Austria (Government Debt Committee).

In Luxembourg, to a certain extent, the BCL assumes the role of an independent fiscal institution. Accordingly the BCL staff continuously analyses the situation and structure of the Luxembourg economy. This enables the BCL to comment on the fiscal sustainability and time consistency of policy actions taken by the government. Examples for this are the general government budget deficit, which amounted to 1.9% of GDP in 2005 after significant surpluses from 1993 to 2002 and a balanced situation in 2003. The BCL explicitly warned the government of risks to the fiscal balance well in advance, already in 2002. Furthermore, the demographical and macroeconomic challenge to the pension system, which by now is widely acknowledged, was subject to a BCL working paper in 2003. The health system was also under scrutiny in several issues of the BCL monthly bulletin. In these respects the BCL by adding an independent and critical point of view to the policy of the government enhances consistency in the process of policy-making in Luxembourg. The major problem the BCL faces in these independent monitoring tasks is the absence of sufficiently detailed information on budget outturns, in particular as regards direct taxes and the implementation of the expenditure programmes of the so-called "special" extra-budgetary funds. The setting up of an independent council – for instance along the lines of the Belgian "Conseil Supérieur des Finances" – with a transparent flow of information between the participants could help overcome this problem.

Numerical fiscal rules and multi-annual budgetary frameworks are also essential in this respect. Since they constrain *ex ante* the behaviour of governments, for instance via expenditure limits, the scope for time inconsistent policies is narrowed. Independent budgetary institutions could be in charge of monitoring the implementation of fiscal rules. These institutions could contribute to improving the definition of fiscal rules, which is of paramount importance. For instance, expenditure rules will not effectively influence budgetary outcomes if they overlook the transactions carried out by extra-budgetary institutions or funds. The rules and their definitions would ideally be enshrined in law. The fact that legal acts are more difficult to change is a protection against time inconsistency. According to a recent study of the European Commission, legally binding rules tend to be more efficient than softer rules.

1.2.2 *Monetary policy*

In 1958 London School of Economics professor A. W. Phillips published an article in which he showed an empirical connection between wage inflation and unemployment. His data on British wage inflation

and the unemployment rate covered the timeperiod between 1861 and 1957 and showed a negative relation between the rate of change in nominal wages and the number of people without a job.

Of course the idea that a trade-off between employment and inflation exists was and still is a very tempting one to politicians. The so-called Phillips curve could then be interpreted as a menu card that allows politicians to choose whether they want to have high inflation or high unemployment. Soon the temptation was followed and many governments tried to fight unemployment by conducting inflationary monetary policy.

However, when the attempt was made to exploit the above relationship, it collapsed. The employment-inflation trade-off that seemed stable for a whole century broke down during the late 1960s and early 1970s. All of a sudden, those countries that tried to fight unemployment with inflationary policy ended up with both: high inflation and unemployment. Time inconsistency, could again be made responsible for this puzzling fact. Moreover, the solution to the collapse of the Phillips curve was to become the foundation of modern central banking.

The output-inflation trade-off example

In the late 1960s and the first half of the 1970s, the reason for the breakdown of the relationship discovered by Phillips was found. It was mainly due to Friedman, Phelps and Lucas that the difficulty with the simplistic "menu-card" view of politics was unveiled. The newly discovered expectations played a main role in their arguments.

The most important thing to comprehend, these academics claimed, was that the relationship between unemployment and inflation was stable only when inflation expectations were stable. If this was not the case, then the relationship itself would change in structure, and hence collapse. The Phillips curve would simply shift.

The key argument was that inflation expectations of individuals enter the relationship between unemployment and inflation because individuals need a measure of inflation to determine the next periods' real wage. In the end, real variables like unemployment or output can only be determined by real variables like the real wage. Once individuals have adapted their expectations to the accommodative monetary policy of the monetary authority, further monetary expansion is like pushing on a string. It can only lead to high inflation, leaving unemployment unaltered.

The time inconsistency nature of this problem lies in the fact that only unanticipated inflation leads to lower unemployment because it depresses real wages. Again, the socially optimal strategy of the monetary authority changes between periods. Ex-ante it is optimal to follow a restrictive monetary policy aiming at low inflation. Ex-post however, when expectations of the public are formed, and have induced a certain behaviour of the agents, it is optimal for the monetary authority to defect and produce "surprise"-inflation. The monetary authority, however, cannot permanently fool agents with rational expectations, because they are aware of the incentives of the monetary authority to regress on its decision about inflation. So in the end, any attempt of the monetary authority to exploit the Phillips-relationship is doomed to produce inflation without reducing unemployment.

A related example in the Luxembourgish context consists in the nominal wage-indexation rule, which characterizes wage setting behaviour in the Grand Duchy. The wage-indexation rule may in a model of the Phillips curve, prima facie, seem as a device to stabilize inflation expectations, and alleviate the inflationary bias. However some important caveats do apply. Wage-indexation is per definition backward looking so that information concerning expectations is ignored. Moreover, it is prone to supply shocks that strike the economy and may, through second-round effects, heat the wage-price spiral. Recent oil price increases, to name but the most prominent example, have fed into price increases, which in turn have triggered several increases of the index. Through this channel supply shocks have a stronger and more lasting effect than they would without indexation. Several alternatives to resolve this problem have been suggested, mostly by excluding goods with high price volatility from the relevant inflation measure or by tying the index to price developments in neighbouring countries. Further caveats concerning wage-indexation point out that it introduces rigidities into labour markets, which hampers adjustment processes. Lastly by mitigating the cost of inflation for wage earners it may reduce the will to fight inflation. Hereby wage-indexation influences the incentives and hence the credibility of the authorities.

2 The monetary policy of the Eurosystem and the time inconsistency problem

2.1 Central banking and the time inconsistency problem

The insight on the time inconsistency problem of monetary policy made it clear that some sort of commitment device was necessary in order to overcome the inflation bias of monetary policy. Research had shown that under discretionary monetary policy certain equilibria were not attainable in the presence of rational agents. In the 1980s several proposals were made on how to resolve this problem.

One idea was for the monetary authority to invest in "good reputation" by continuously fighting inflation and by this shape the expectations of the private sector concerning future inflation. In the end it was the economist Kenneth Rogoff who showed that a good solution was to delegate monetary policy to an independent central bank. The incentives set for the central bank had to be such that it would be able to make economic agents believe in its determination to deliver price stability. For instance, one could make the central bank president's wage depend on the degree of price stability that his policy delivers. New Zealand went even further as according to his employment contract, the Governor can be dismissed if the inflation rate exceeds the target. The Governor of the Bank of England has to explain the underlying reasons and to present appropriate monetary policy measures if inflation deviates more than 1 p. p. from the target set by the Government. So to delegate monetary policy to an independent central bank was supposed to allow for a good balance between credibility and flexibility. On the grounds of these arguments central banks throughout the world were reformed with a special focus on giving them more operational independence.

Independent central banks have to keep in touch with markets and guide market participants through sensible monetary policy. The central banks' obligations are mainly twofold. On the one hand a central bank has to conduct monetary policy such that price stability is maintained. On the other hand, central banks can help to stabilise the economy, when it is shaken by fluctuations. Those obligations are two sides to one medal and what is of utmost importance to fulfil them is credibility.

On February 7th 1991 the Treaty on European Union was signed in Maastricht. After having experienced an extended period of very high inflation between the mid 1960s and the mid 1980s, an essential aim of the participating nations was to assure price stability. In order to achieve this, the aim of price stability and the independence of the European System of Central Banks (ESCB) were enshrined in the Treaty.

Next, I will present the strategy of the Eurosystem to you, thereby focusing especially on the issue of time consistency.

2.2 The Eurosystem monetary policy

As a relatively young organisation, the ESCB with at its heart the ECB was able from start to cherish the fruits of the research I just presented. As a result, many important results were implemented straightaway. The first and foremost example thereof is the crucial role that is given to price stability. To manifest this importance, Article 105 of the Treaty on European Union stipulates that the primary objective of the ESCB "[...] is to maintain price stability". All other objectives are subordinate to this. Obviously, this is to make clear to the public, that the ESCB is committed to price stability only. To emphasise this, the article continues: "[w]ithout prejudice to the goal of price stability, the ESCB shall support the general economic policies in the Community with a view to contribute to the achievement of the objectives of the Community [...]".

2.2.1 Commitment devices of the Eurosystem

As I just described, it is not only important to clearly state a certain goal in order to influence expectations. The other important and presumably more difficult part is to make that statement credible to the public.

In order to make its monetary policy ambitions credible, the Eurosystem needs devices that prove its determination to maintain price stability. A key ingredient, if not the most important, for credibility, is a clear quantitative definition of price stability.

Milton Friedman, at the time, trusted neither politicians nor central bankers and thus advocated a constitutional rule that required constant money growth. Constitutions are devices well suited to prove the seriousness of a purpose. Since it is hard to change them, even for politicians, they provide a

strong insurance against a government changing its mind. It is certainly with this fact in mind that the price stability target was included in the article 105 of the Treaty on European Union. As a primordial prerequisite for the monetary union and considering the above-mentioned time inconsistency issues, the Treaty is the appropriate place for defining the major objective of the ESCB. In order to further clarify this target, the Governing Council of the ECB defined price stability in October 1998 as: "[...] a year-on-year increase in the HICP for the euro area of below 2 %". In May 2003 the Governing Council further narrowed its target by restraining inflation rates to be "[...] below but close to 2 % over the medium term".

A clearly defined and appropriately fixed objective is one part of ensuring credibility. The other part is taking responsibility for the results of monetary policy. This gives the public the opportunity to hold the Eurosystem accountable. The fact that the target is clearly defined makes it easier to evaluate the results of the policy measures taken. Accountability is important since with central bank independence it is difficult to sanction its actions.

Transparency is a key prerequisite for accountability. An important part of transparency lies in the definition of the targeted inflation rate. Furthermore, the steps taken to achieve this goal have to be clarified as well. An important instrument in this respect is the two-pillar strategy of the Eurosystem. By analysing the real and the monetary side of the economy and by subsequently cross checking the results of this analysis all decisions can be justified. Moreover, policy decisions, once they have been taken, understood easily by the public, since the underlying data is published regularly. The ECB tries to meet all these communication requirements with its wide range of publications and press conferences.

The credibility and the independence of monetary policy is enhanced if fiscal discipline prevails. In spite of the monetary union, fiscal policy remains in the hands of the national states. In order to guarantee the soundness of national budgets and to avoid any disruptions to the mechanisms of monetary transmission induced by fiscal imbalances, the Treaty and the Stability and Growth Pact puts certain constraints upon the ability of Member States to run deficits and make debt.

2.2.2 Inflation and expected inflation in the Euro area

Central banks throughout the world have built up their reputation over time. Among the best known are obviously the United States' Federal Reserve, the Bank of England or previously the Bundesbank. This tradition implies that market participants have some experience on how those central banks conduct their monetary policy, how they react to shocks and how "hawkish" or "dovish" they are on inflation. Reputation helps those central banks enhance their credibility and stabilize markets because it reduces uncertainty. The Eurosystem did not have such a track record when it started its mission in 1999. Market participants first had to collect some experience on the Eurosystem monetary policy conduct.

Since the introduction of the Euro in 1999, the average HICP inflation rate according to Eurostat was 1,97 percent, since 2000 the average lies around 2,1 percent. This is very close to the price stability set.

As I laid out to you, stabilising prices implies stabilising expectations on prices, since inflation expectations are as important to economic processes as actual inflation is. In order to gauge the public's assessment on how committed the Eurosystem is to fight inflation, I will report the results of the Survey of Professional Forecasters to you. This survey has been carried out by the ECB since early 1999, and consists of a questionnaire on expectations sent to experts affiliated with financial or non-financial institutions based within the EU. The expectations are reported for several time-periods. For example, one year ahead inflation expectations started off at a level of 1,2 percent in the first quarter 1999. They reached a temporary maximum in the second quarter 2002 at a value of 1,9 and during the whole period from 1999 until the beginning of 2006 they never crossed the 2 percent barrier. Only recently, in the second quarter of 2006, did one year ahead inflation forecasts rise to 2,1 percent reflecting the oil price and fiscal shocks (i.e. the German VAT increase) the Euro area is undergoing. Concerning longer-term expectations, the forecasts are similar. Expectations on two year ahead HICP inflation rates vary mainly between 1,5 and 1,9 percentage points. These results can be interpreted as a proof of confidence of the "expert" public in the ability of the Eurosystem to achieve its target.

Important and complementary indicators for the credibility the Eurosystem are longer term inflation expectations. These are more stable and less affected by different shocks than short term expectations. For example, short-term expectations are for the moment influenced by rising oil prices

or the insecure political situation in the middle East. In the long run, the fundamental economic data are of more relevance for inflation expectations. Long term average inflation expectations as reported by the ECB's Survey of professional forecasters have been at 1,9 % for the last 18 quarters consecutively. Very similar results have also been extracted from other surveys like that of 'Consensus Economics' or the 'Euro Zone Barometer'.

Overall, the Eurosystem has achieved credibility among market participants. This is also very important considering the uncertain environment, which the Governing Council of the ECB faces, in its day-to-day decision-making. In what follows, I am going to touch on this issue.

3 Monetary policy and uncertainty

Far from the deterministic world of models in which researchers can exactly predict the effects of a change in a certain variable, there is the real world, which the Governing Council of the ECB faces at its monthly meetings. There are many possible disturbances that feed the monetary framework with uncertainty in numerous respects. In the recent past, we had to deal with terrorist attacks, asset price bubbles and extraordinary rises in the oil price, just to mention a few. All of these events affect and change the structure of the framework a central bank has to deal with and add uncertainty to the process of conducting monetary policy.

Among the many forms of uncertainty the most relevant for central banks is twofold. The first concerns the transmission mechanism of monetary policy, the second is about the current state of the economy.

Concerning the mechanism of monetary policy transmission first of all, since the introduction of the Euro we have noticed an important move towards a closer integration of capital markets and the banking system. This has impacting repercussions on the way and the amount by which interest rate decisions are passed through to the economies. Nevertheless, since the Euro area still remains heterogeneous in structure, the pass-through may be quick in one region while it is rather stodgy in another. Recent labour market reforms in several member states as well as changes in social security systems influence the transmission mechanism further. All this continuously affects the process at hand and the Euro area of today may well be quite different from that of 1999.

The second important source of uncertainty concerns the state of the economy. Again the division can be made between aggregate uncertainty and uncertainty at the country level. Among experts the opinion is not always unanimous concerning the state of the economy. There are many indicators and many ways of interpreting them, so discriminating between a temporary slowdown of the economy and the beginning of a recession or between a sound recovery and irrational exuberance is not always obvious. It is no wonder that at times reference is made to the "art of central banking".

In order to cope with the special situation of the Euro area and with uncertainty in general the Eurosystem applies several instruments, which are either substitutes or complementary to each other. To start with, a solid foundation for monetary policy was created. The detailed and published monetary policy strategy reduces the uncertainty on behalf of the public concerning the objectives and behaviour of the Eurosystem. As I have just explained the Eurosystem tries to achieve the highest possible reliability by means of a clear objective and a high degree of transparency and accountability. The Eurosystem tries to reduce uncertainty about the structure of the economy to the maximum extent possible through the systematized analysis of the full information set, i.e. the renowned two-pillar strategy. By closely monitoring the real and the monetary side of the economic situation of the Euro area, the Eurosystem gathers all available information and by cross checking this information, the uncertainty is reduced to a minimum. Furthermore, in order to be prepared for broader changes in market structure and to foster the understanding of economics a heavy weight is laid on the conduct of genuine research. Lastly considering the remaining uncertainty, policy is generally conducted in a cautious manner. Indeed, the main body of literature considers a "non-activist" and gradualist policy conduct to be optimal in most cases of parameter uncertainty.

4 Conclusion

Kydland and Prescott have shown in their work about time inconsistency of policy, how important it is for a government (or a monetary authority) to make itself and its policy credible among the public. This has led to widespread reforms in the sector of central banking throughout the world in the mid- to late-1980s and the Authors of the Maastricht Treaty on European Union have integrated these insights.

By carefully adopting a specific monetary policy strategy appropriate for the Euro zone, the Eurosystem succeeded, even without a track record and in spite of many turbulences and shocks of various markets, to keep inflation low and close to its target. Moreover, inflation expectations, a key indicator for the trust of the public in the policy of the Eurosystem, were also kept at a level compatible with the announced definition of price stability.

In conclusion the time inconsistency problem has been well solved in the practice of modern central banking, notably by the Eurosystem. Even if uncertainty and unforeseen events, have in the past and will in the future prevail, the ECB has had a good start and achieved credibility with the public. This has been achieved by means of a framework that on the one hand delivers the determination necessary for credibility and on the other gives the flexibility that is essential to react to unforeseen events.

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