

Bengtsson, Ingemar

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A framework for understanding inflation - with or without money

by

Ingemar Bengtsson¹

Department of Economics,

Lund University

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¹ Ph.D. Ingemar Bengtsson, Department of Economics, Lund University, P.O. Box 7082, SE-220 07 LUND, Sweden, email: ingemar.bengtsson@nek.lu.se

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Abstract

This paper presents a model that pictures how inflation is determined in a decentralized market process where prices are set in both simultaneous and sequential contracts. Price setting is seen as a coordination game between the price setters of sequential contracts. An important property of the model is that inflation thus can be explained without any reference to the quantity of money.

Following up the finding that inflation is determined in a coordination game, it is subsequently claimed that whenever inflation does not follow a random path, people do seem to follow some rule of thumb when predicting future price levels. In the last section of the paper, it is finally claimed that this rule is best understood as a focal point, and furthermore that the central banks provides the focal point for inflation in the western world today. Central banks could thus be shown to be able to influence inflation rates, although the quantity of money plays no part in this process.

* This paper is prepared from my Ph.D. thesis *Central bank power: a matter of coordination rather than money supply*. Some of the feedback that I have received on various parts of the thesis concerns the material in this paper, and I am thus grateful for remarks and suggestions from Tyler Cowen, Kevin Dowd, Benjamin Friedman, Charles Goodhart and Michael Woodford. Naturally, I am solely responsible for all remaining errors and obscurities. I am also grateful for the financial support from Torsten och Ragnar Söderbergs stiftelser, which enabled me finishing the thesis.

1 Introduction

I have elsewhere [Bengtsson (2003)] argued that the supply or demand for money is not decisive for price level determination. In this paper, we will make use of those findings to outline a framework for a general theory of price level determination, or inflation. We will explicitly account for the simple fact that a price level is an index of individual prices, which are the result of decisions by individuals, who in turn base their decisions on their best judgement of future price levels. This would seem an obvious route to take. If asked, not many economists would disagree with the claim that the price level is nothing but an index of individual prices. Nevertheless, much analysis is carried out as if it were in fact possible to talk about inflation with no regard to actual prices. Consider for example the view that: *“The conclusion is that substantial changes in prices or nominal income are almost always the result of changes in the nominal supply of money.”* [M. Friedman (1992:249)] This statement asserts that the quantity of money will determine the level of prices. We must therefore conclude that the quantity of money also determines individual prices. Assertions such as this are, however, rarely accompanied by an account of (a) how the quantity of money has increased or (b) how individual price setters take this into account when they negotiate or quote prices. Rather, both (a) and (b) are assumed to happen, as in the case of M. Friedman (1992:248).

Starting from a situation in which the nominal quantity that people hold at a particular moment of time happens to correspond at current prices to the real quantity that they wish to hold, suppose that the quantity of money unexpectedly increases.

Why should we *“suppose that the quantity of money unexpectedly increases”*, perhaps because there has been a *helicopter drop of money*? The lack of realistic suggestions regarding how changes in the supply of money affect price setters suggests in itself that economists who use this jargon are not themselves fully aware of the meaning of their proposition on an individual level. As I argue in Bengtsson (2005:3) it is only in the hypothetical world where *all payments are made exclusively with cash*, that it would be possible to interpret the velocity as a measure on how many times an average note is used during a certain period of time. In the real world where payments are made also by the use of other means, it is an empty metaphor and the only way to interpret the concept of velocity is as the residual that makes the quantity identity hold. Hence, the quantity identity is not applicable in discussions about a link between money and prices.

2 The transaction costs perspective on prices

An alternative to the aggregate perspective of quantity thinking would be to recognize the fact that the price level is not an object in the real world, and move on from there. The price level is, of course, not a variable in its own right but a convenient way to talk, in one word, about prices on many different items. The possibility to do so is important when we try to extract true information from encountered price changes. However, although the price level is a very useful concept, it is nonetheless inaccurate to treat it like a variable. Above we claimed that in the conventional thinking about money and prices - the quantity of money thinking - it is presumed that the quantity of money determines the general level of prices. Hence, we can not use those ideas when we want to answer precisely the question whether changes in the supply of money could lead to changes in the general level of prices. Though economists in general have had faith in the belief that the quantity of money determines the level of prices, we will not accept this standard conjecture.

3 Simultaneous contracts, sequential contracts and future price levels

In this section we will attempt to establish a basic intuition for a general theory on how nominal prices are set. Prices stem from transactions and transactions imply contracts and the establishment of contracts involves transaction costs for negotiating and enforcing them. Consequently, trade would be very costly if all transactions were handled by simultaneous and/or complete contracts, for instance, if a worker somehow were to be paid continuously, or if a new contract were to be written between a car manufacturer and its subcontractors for each item delivered. Negotiations and the establishment of contracts would use up most of the efforts available.

Complex production that uses specialized labor therefore makes extensive use of *sequential* contracts.¹ In some cases, transaction costs are so large that production is organized in hierarchies, i.e. firms, rather than in markets. This is a message that we know from “The Nature of the Firm” by Coase (1937). One important consequence of transaction costs is thus that in many situations, a *sequential and incomplete* contract is more efficient than a *simultaneous* contract, despite the apparent risk that conditions

¹ Regarding sequentiality, we are interested in two types of contracts: (a) *simultaneous* contracts, in which deliverance and payment are completed instantly, at the moment of transaction as in a supermarket purchase, and (b) *sequential* contracts, in which the terms - in particular the price - of the contract are determined instantly while either deliverance, payment or both are completed at a future point. When considering the issue of price level determination, we confine our use of the term *sequential contract* for such contracts with a *predetermined price*, though in reality other kinds of sequential contracts are possible. The important feature of the sequential contract is that it fixes a nominal price for some time, which makes it useful as a guide to future prices - typical examples are wage contracts and utility contracts. Those contracts will necessarily influence inflation, both directly and indirectly as they will be used by others as coordination points of inflation. (The reader should be aware that a fixed price only means that a predetermined price is agreed upon in a contract; obviously, all contracts are possible to renegotiate or breach, if only at a cost.)

could change during its existence.² From this point and forward, the term sequential contract will imply a contract in which the obligations of both parties - specifications of the product (quantity, quality, deliverance) and payment (nominal price and possible payment technique) - are determined in the contract from the start, while payment and deliverance are completed only at one or several future dates; the critical feature is the predetermined nominal price. There are numerous examples of such sequential contracts in an economy, for instance wage contracts, utility contracts and contracts between a firm and its subcontractors. A wage contract, for example, normally runs for one or several years, and has a predetermined nominal value. The employer pays the employee once a month in return for performed work. The employee agrees to let the employer command his labor in exchange for a promise to be paid a pre-specified nominal value with an agreed-upon payment technique. The wage contract appears to consist of two sequential contracts, where one regulates the nominal labor value and the other the payment procedure along with a command over labor. The former, comprehensive, contract that regulates the nominal value of labor during the contract term is an example of the sequential contract that we discuss. In a simultaneous contract, on the other hand, deliverance and payment are simultaneous events, for instance when you pay for purchases at a supermarket.

The notion of the sequential contract is crucial to our analysis, since we claim that the stock of overlapping sequential contracts defined in nominal terms determines inflation in the short run. Thus, our anchoring mechanism corresponds to concrete action and clearly breaks with the quantity tradition in which the anchoring mechanism is on the aggregate level, relying on predictions about a variable – the velocity of money – that does not exist in reality.

Nominal, sequential contracts are used in many different situations, in spite of the cost they involve in the form of inflation risk. In fact, the use of sequential contracts signals that the participants view the specific costs of using spot markets or writing comprehensive contracts as greater than the specific cost of the inflation risk that the sequential contract exposes them to. This leads to the conclusion that these contracts will not be reneged to adapt ex post to moderate changes in the inflation rate. This must be the case, since otherwise the nominal, sequential contract would not have been used in the first place, but rather an indexed contract or a series of simultaneous contracts. I would say that the nominal, sequential contract is chosen precisely because the participants in the contract perceive the cost of making an inflation-contingent contract

² Cf. e.g. Posner (1998) about sequential transactions.

as higher than the cost of a possible inflation risk. To sum up this discussion, we will refer to *nominal* sequential contracts in the following discussion of sequential contracts. In each such contract, a number of nominal value units are related to a specified amount of goods or services. These contracts constitute the tie between the real and nominal sides of the economy.

3.1 The link between nominal and real prices

Nominal contracts tie individual prices to the real side of the economy. Ideally, the price level is an index of all individual prices, their weight proportionate to their share of the total transaction value.³ What determines individual prices determines the price level as well. Prices are established either in simultaneous or sequential contracts. The important difference in this regard, between simultaneous and sequential contracts, is that while a price stated in a simultaneous contract can quite easily be changed from one day to the other, the same is not true for a price stated in a sequential contract. Simultaneous contracts only exist instantaneously, and a change in their terms only incurs a minimal cost with respect to transaction costs. That is, as a retailer e.g., you may have some menu costs for changing the prices on your goods, but you do not need to negotiate with the customers about price changes because you have no lasting contractual relationships. Simultaneous contracts can therefore not be decisive to the dynamics of the general price level, i.e. how the inflation rate evolves over time. On the other hand, if expectations of future inflation, or actual inflation, change, prices stated in sequential contracts can not easily be changed. Hence, sequential contracts - as opposed to simultaneous contracts - will necessarily have an anchoring function on the inflation rate, as we will later discuss in some detail.

When a firm agrees on the terms in contracts on wages or long-term financing, it does so with certain expectations regarding the overall production efficiency in mind, i.e. regarding both internal efficiency and market conditions. Only if these expectations are fulfilled will the intended price charge be consistent with the desired and expected profit level. Thus, there is a unique price for their simultaneous contracts corresponding to the firm's sequential contracts, *ceteris paribus*. This implies that it is possible to forecast future prices from a firm's sequential contracts today, or more precisely, the future price a firm is expecting. The same is true for consumers. As employees, they enter wage negotiations with certain expectations about future inflation, which means that wage

³ More precisely, each individual has his own ideal price level, based on his preferred basket of goods and services. In the aggregate, the ideal price level should be based on actual aggregate sales. Alternatively, one could also argue that the ideal price level should be a direct sum of all prices, since this would express changes in one's opportunity set. However, since

contracts will include an inflation compensation part, which in turn will reflect the employer's and the employees' expectations about future prices. When the wage contract has been settled, both sides will take it into account when they make decisions on other long-term contracts. Wage contracts is only one example, the same is true for all sequential contracts. Sequential contracts will therefore inevitably have impact on expectations about future inflation as well as realized inflation during the contract duration.

4 Short-term: overlapping contracts

Due to transaction costs, it is expensive to violate a sequential contract, and hence the contract is fixed within some boundaries, i.e. it requires rather strong incentives to induce a breach of sequential contracts.⁴ To see how this affects the issue of price level determinacy, imagine that different groups engage in contracts of different length. This is a plausible idea since each business activity faces its own specific set of uncertainties. Then it follows that at the beginning of each period, there are a number of contracts that are still valid. If the period studied is sufficiently short, there is just one contract (concerning the period in question) that has not yet been written. The parties that will negotiate about the particular contract are able to observe all running contracts, and thus able to estimate the inflationary component in each, which provide them with the needed link between nominal and real prices. All they have to do is to negotiate about a relative price and then use the existing price level to set a nominal price. Given the price level, there is a unique nominal price consistent with each specific real price. Thus, the nominal price level is, in a static sense, at every moment determinate, without even mentioning money. This is not to suggest that it is easy to negotiate a price, only that obstacles involved all concern the task of agreeing on a relative price. Neither do I suggest that people do in fact bargain in terms of relative prices – they do not have to since they know how to make reasonable predictions on the future value of the unit of account. There is a certain circularity here: it is precisely because we are continuously writing contracts in terms of the unit of account, we can continue doing this.

Think of two groups of employees, A and B. Suppose that A enters a two-period contract in period one, and B enters a two-period contract in period two. The question is how they will respond to each other's contracts concerning period two. The answer is that since group B observes group A's contract, they will write a contract on an inflation level *in a certain relation* to group A's. That is, depending on their objectives, they will try

one actually consumes different quantities of different goods, the proportionate price level reveals more information about how one's possibilities for consumption actually have changed.

to include more, less or the same inflation in their contracts, compared to A's, i.e. they will set their inflation component in relation to A's. The group's objectives is presumably important when we analyze inflation, but it is of minor importance to the determination problem, since it is solved as long as there is *any* decision rule at all, as we will explore later. Given what we just said, A can figure out how B will behave and can therefore choose a nominal level without regard to B's action. This is because A knows that B will set its inflation component in relation to A's. Consequently, the nominal price level in this model could be anything, *if* we assume that A and B are the only participants. It may therefore appear as if overlapping contracts are unable to pin down the price level. Nevertheless, in reality, this problem never appears in the short run, since there will always be other running contracts that can be used to extract the inflationary component. If we consider relatively short contracts, no one will actually be in A's situation, and everybody will face B's situation. We have used employees in our example, but we may as well have discussed the employer side, since they face the same situations.

This is the basic nature of short-term price level determination. Although it may be very important to analyze differing outcomes based on different objectives, this discussion will have to be postponed until future studies. Instead, our intentions are to analyze the question of whether and how the price level can be determined. *What* price level will be determined is a quite different question.

5 Long-term: a coordination game

I have argued that overlapping sequential contracts provide a sufficient nominal anchor for a determinate price level in the short run. As a theoretical point, however, at the end we can not rely on the existence of overlapping contracts, since there must be some agents who enter a contract that is the first contract valid for a period in a remote future. Consequently, these agents will have to make a forecast about the inflation during the time period when the contract will be valid, without reference to any running contract. Hence, there is no obvious anchor for nominal prices, and expectations about the future price level are in fact all that pins down the price level in the long run.

The price level being in this sense indeterminate does not mean that it is impossible to predict. On the contrary, agents have to live in this world and they do make expectations about future inflation. Our task is now to understand how agents form inflation expectations in real life, expectations that will in fact determine the actual inflation. In

⁴ A sequential contract is evidently costly to break up, because if it were not, there would be no point in using a sequential rather than a simultaneous contract in the first place.

order to understand the situation of price setters when they decide upon new long-term contracts, we will sketch the kind of game in which all price setters participate, whether they are aware of it or not.

In a period without any running contracts, what they believe that other agents will think about the inflation is all they have to base their expectations on. Thus, in the long run the inflation will be whatever the aggregate of individual agents believes it will be.⁵ A solution of long-term determinacy demands a model of how long-term inflation expectations are established. The standard rational expectations hypothesis offers no solution under those conditions.⁶ For a pure chain of expectations about expectations, it is not possible to derive a unique solution using bare logic (it is rational for me to expect the same as you expect and for you it is rational to expect the same as I expect, i.e. it is rational for me to expect what I expect), and we must, as people in the real world, find another way to solve the problem of expectations formation.

Agents that are about to enter long-term contracts face a coordination problem. No matter if they publicly over- or underestimate their true expectations about future inflation, they would still like to base their decisions on the best possible expectation. Depending on the settings, we can describe this coordination in, at least, three different situations: in the first situation, only one contract group at each time writes a contract for the period in question. In this case, the first group would be indifferent to the choice of inflation component. As we have discussed earlier, they know that the following groups will use their contract as the nominal anchor. However, we ignore this situation since it does not appear to give a reasonable picture of the economy. The other two situations concern a case in which there are several groups that simultaneously write contracts for the future period. The case can be divided into two sub-cases. The first appears when the participating agents are able to cooperate explicitly. However, this description of the economy does not seem reasonable, either. It would induce huge transaction costs to find out who all the others are, contact them and to decide on a figure. Moreover, if there were groups that would like to overstate or understate inflation in their own contracts, then it would be costly to cooperate since a system for punishing those who are cheating would be required.

We are left with a situation, in which several groups simultaneously enter contracts concerning the same future and not-anchored period, without any possibility of explicit cooperation. We now propose that the concept of *focal points* could suitably be applied to

⁵ Black (1995) expressed the same opinion, but without developing the idea in further detail.

⁶ Cf. e.g. Frydman (1983: 118) : "The analysis in this chapter suggests that the rational expectations hypothesis does not, in general, characterize expectations formation of agents in decentralized markets."

this problem.⁷ The concept is described as follows in the game theory textbook by Drew Fudenberg and Jean Tirole (1995):

If the two players have not played the battle of the sexes before, it is hard to see just what the right prediction might be, because there is no obvious way for the players to co-ordinate their expectations. [...] However, Schelling's (1960) theory of 'focal points' suggests that in some 'real-life' situations players may be able to co-ordinate on a particular equilibrium by using information that is abstracted away by the strategic form.

The information that they refer to is what we could call the social and historical context where agents are living and which for example has decisive influence over the content of their imagination. The importance of social and historical context also implies that we should expect that the focal points used by agents vary from country to country and also over time. That is, if we find one particular institution to be a focal point in one country, we should not take for granted that the corresponding institution in a different country is a focal point too.

For the sake of simplicity, we will hereafter consider a case, in which all agents *ex ante* would like to include exactly the *ex post* realized inflation in their contracts. The coordination problem is less complex to illustrate under this assumption and to our purposes, it is still relevant. This is because the outcome of a negotiation between two counterparts with conflicting interests may well mimic the outcome of a negotiation under mutual interest. Anyway, it would still be a coordination problem if we assumed conflicting interests.

Assume that we have two groups (each involving two sides with conflicting interests, as e.g. employers and employees negotiating wages) which, without the possibility to explicitly coordinate, simultaneously will be the first to write contracts for a future period *t*. Assume, to begin with, that they both can identify three different strategies, i.e. to choose one, two or three per cent as the inflation component in their contract. The two groups have a mutual interest in coordinating, because otherwise they would face the cost of making their decisions on a basis of inaccurate expectations (this cost could be, e.g., the risk of being insufficiently compensated for actual inflation). This cost could be expected to increase with the difference between their chosen inflation compensation. The payoff matrix could then look like the one shown below.

⁷Cf. Schelling (1960)

		A		
		1%	2%	3%
B	1%	A: 0 B: 0	A:-1 B: -1	A: -2 B: -2
	2 %	A: -1 B: -1	A: 0 B: 0	A:-1 B: -1
	3 %	A: -2 B: -2	A:-1 B: -1	A: 0 B: 0

In this payoff matrix, we find three Nash-equilibria on the diagonal. Moreover, if we remove our arbitrary restriction of only three possible strategies, we would have an infinite number of Nash-equilibria, but none of them a dominant strategy. In the absence of a focal point, any expectation is as good as the other. The question is hence which strategy constitute a focal point and this will be in our focus later in the paper. For the next few sections, we will look at the properties of our model in more detail, under the assumption that there is a focal point solution to the coordination problem.

6 A simple model of prices in a fiat money world

A simple model that captures the basics of our decentralized market process approach to the subject of price level determination may facilitate our understanding of the idea. The basic structure is borrowed from the Fischer-model of staggered labor contracts, although with some important modifications: we are only interested in the nominal side of the economy and for reasons that were discussed in the introduction, our model does not include any monetary variables.⁸

Consider the following equations, all variables expressed as logarithms:

$$w_{t,t} = E[P_t | t]$$

$$P_t = \sum_{i=1}^n \sum_{j=0}^{\infty} \alpha_{t-j,t}^i \times w_{t-j,t}^i$$

$$E[P_t | t] = \sum_{i=1}^n \sum_{j=1}^{\infty} \alpha_{t-j,t}^i \times w_{t-j,t}^i + \sum_{i=1}^n \alpha_{t,t}^i \times E[w_{t,t}^i | t]$$

The variable w stands for wages, which we assume are the only prices determined in sequential contracts in our model. There is no productivity growth and each nominal wage is set to achieve a constant expected real wage in each of the two periods. Hence, the wage increase w_t in period t , determined at the beginning of period t , is set equal to

⁸ Cf. Blanchard and Fischer (1989) about the Fischer model. It should be noted that the Fischer model is about the transition of monetary shocks to real production. I have just borrowed some parts regarding the formation of inflation expectations. The results derived here are thus not a consequence of the original Fischer model.

the expectations $E[P_t]$ of inflation P in period t , based on the information available at the beginning of period t . The labor market is divided into n parts, each consisting of the two counterparts employer and employee. The parameter α denotes group i 's influence on the price level, i.e. the share of total volume of sales it governs. Inflation expectations are established in accordance with the price equation. Those who write sequential contracts for the period t at the beginning of period t observe all contracts made in period $t-1$ and earlier, but have to forecast the inflationary content in other contracts written at the same time.

To keep notation as simple as possible, we simplify the model further and consider an economy where a third of the labor market is negotiating a three-period contract in each period, with possible different wages for each period. Applying rational expectations, we can derive the following wage equations:

$$w_{t,t} = \frac{1}{2}w_{t-1,t} + \frac{1}{2}w_{t-2,t}$$

$$w_{t,t+1} = w_{t-1,t+1}$$

$$w_{t,t+2} = w_{t,t+2}$$

When the parties negotiate a wage for the first and second periods, they set them equal to a weight-adjusted mean of already running contracts for the period. As we should expect, the model displays a high degree of self-fulfilling expectations in the short run.

Our earlier conclusions about long-term properties become clear when we look at the wages for the last period. For period $(t+2)$, the wages are indeterminate under rational expectations. The model provides no guidance as to which implicit inflation component should be included in the parties' contracts. While some may argue that this is an undesirable feature of this model, I would claim the opposite. For example, it is precisely because the price level is indeterminate in the long run that it is possible for economies to develop hyperinflation, as real economies evidently do sometimes. Interestingly, it is also the reason why at all a monetary policy can be successfully pursued. If the price-setting process actually were determinate, there would be no role for central banks in it.⁹

⁹ Remember that the only way for the central bank to influence inflation is to influence the price-setting agents' expectations about inflation. If expectations formations were a purely logical problem, such an influence would be impossible, or at least very unlikely.

6.1 Shocks and costly information

Implicitly, we have thus far assumed that all agents possess complete information about all other agents' contracts and that this can be used to estimate exactly the embedded inflation compensation. We also assumed that the relative price structure is known with certainty, for now and for the future. If we loosen up these assumptions, we inject two sources of uncertainty that may force inflation rates to change. The primary source of uncertainty consists of the possibility of shocks to relative prices that would force the ex post inflation component in a contract to differ from what was ex ante expected. The secondary source is the possibility of a wrongly estimated inflation component in other agents' contracts, which becomes interesting once we allow primary shocks. The combined fact that future shocks may make a forecast that is currently the best possible all wrong, and that it is very costly to make the best possible forecast, provides a strong case for the use of *simple rules of thumb* rather than the best possible forecast based on already running contracts.

We have already said that, as a theoretical point, in the very short run, basically all nominal contracts can be thought of as sequential, and hence the price level as fixed. As we consider an increasingly distant future, the proportion of already running, sequential contracts to not yet negotiated contracts decreases. Consequently, the possibility for new information to influence the inflation rate increases with its distance from the present. Accordingly, sequential contracts become decreasingly important as guidelines for inflation expectations, while our simple rule for inflation expectations becomes increasingly important. In our basic model, it was only at the hypothetical end that the rule was needed to determine inflation expectations. If we consider that some contracts are valid for very long periods, the rule does not appear to be of much importance in practice. However, we now acknowledge that shocks to relative prices, amplified by the circumstance that agents have incomplete information about other agents' contracts, may induce changes in the inflation rate. Then we will find that the need for a rule applies also to contracts of shorter duration. For example, a decision regarding the inflationary content of a medium-term sequential contract would hence involve forecasting those primary and secondary changes, in addition to the need to extract inflationary content from the stock of sequential contracts. It may well be the case that the cost of acquiring and interpreting information about other contracts and about possible shocks is high enough to make it more profitable to individual price makers to follow a simple rule, or a professional forecaster, than to make their own forecast.

7 A rule to follow

Once we have concluded that the inflation rate can change because of uncertainty concerning some real economic factors and because of a costly verification of other's contracts, uncertainty both about running and future contracts arises, too. Above, we argued that it would therefore be reasonable for an agent to follow a simple rule of thumb rather than trying to extract all possible information from already running contracts.

However, in reality, we have more options than to choose either one of two extremes, i.e. to follow a simple and rigid rule, or to make the best possible prediction. It would seem reasonable to believe that most agents in fact would do something in between. While it is costly to extract information from other agents' contracts, it could still be worth the effort to extract some of the potentially available information, particularly if you are good at it. We should therefore assume that agents will try to improve the simple rule and that some agents will become considerably better at it than the average agent. These *specialists* should then be able to profit on this ability, either by acting on their prediction on the market or by selling information to the average agent.

Thus, it is not obvious that a simple and rigid rule is in fact a natural choice for inflation expectations. In an economy with a history of a very stable inflation rate, people may coordinate on an expectation of constant, self-repeating inflation, but under different circumstances, people may learn to coordinate on something else, for instance a Royal forecast or a politically declared goal for inflation. Under yet other circumstances, the public may not be able to coordinate at all. In this case, society is prone to develop hyperinflation. Next, we will consider the possibility that a *focal point* for coordination of expectations of inflation might emerge and use this idea to understand the role of *central banks* in price level determination.

8 Focal points

Schelling (1960:54) illustrates the idea with the case of a couple who has lost each other in a department store. Although they may not have consciously thought about where to meet if they get separated, the chance that they will think of the same place to meet - perhaps at the lost and found desk - is far greater than what a pure random choice would suggest. Schelling (1960:58) further emphasizes that imagination is as important as logic to be successful in this kind of coordination game.

Logic helps - [...] - but usually not until imagination has selected some clue to work on from among concrete details of the situation.

The point here is that the notion of focal points captures rational behavior that is difficult to express in logical terms. It is rational to use a focal point, although we can not logically argue that the focal point is a more likely coordination point than the alternatives. Thus, to be rational is not only to make logically consistent decisions, but also to make purposeful decisions with respect to all consequences, as in the pragmatist view of rationality, here expressed by Richard Rorty (1992:581):

Rationality is the name of an ability which squids have more of than amoebas, which language-using human beings have more of than nonlanguage-using anthropoids, and which human beings armed with modern technology have more of than those not so armed: the ability to cope with the environment by adjusting one's reactions to environmental stimuli in more complex and delicate ways. This is sometimes called "technical reason", and sometimes "skill at survival".

The model, which we were sketching on in the previous chapter, predicts that in the long run and in the absence of a focal point, any expectation is as good as the other. The choice of an inflation level to incorporate into a long-term contract looks similar to the choice of a meeting place in Schelling's example. Therefore, the focal point concept seems indeed relevant to an analysis of the determinants of inflation.

8.1 The central bank as a possible candidate as focal point

Alan Kirman (1997) has developed an analysis that offers an explanation as to how agents on financial markets use expert forecasters to form their own expectations about future prices:

In asset markets, decisions as to how much buy or sell are made on the basis of expectations as to future prices. The standard way to solve for equilibrium prices in such a situation is to make the assumption that individuals have "rational expectations". Yet, in many cases agents do not form their own expectations about the prices of the assets. They instead follow the advice of "experts" or "gurus". The question then arises as to which guru they should follow. If, as is the case in financial markets, the number of people that are following a particular forecaster has a direct impact on the price on the asset, the individuals have to consider this when making their choice. Thus, Keynes' well-known "beauty queen" problem can be thought of as an example of one of Schelling's focal points. Think of the contestants as financial experts and then think of the economic agents as choosing amongst them. Suppose that the situation is completely symmetric and that if everybody chose a particular expert his forecast would turn out to be correct.

Kirman's analysis, which originally was applied to the spot market for currencies, should apply as well, and maybe even better, to nominal price level determination. As we have said, we have no fundamentals at all to rely on in the (ultimate) long run. The price level is hence freer to vary with expectations than are prices on financial assets. Kirman's analysis explains how it is that a forecaster who has the public's confidence eventually may be abandoned although the public's expectations are largely self-fulfilling. Kirman makes the following conclusion:

This paper has explored the idea that individuals will learn to follow certain experts as a result of their experience. This tendency is self-reinforcing. In a situation in which none of the experts is perfect there will always be swings from one guru to another. Popular opinion will, however, follow 'better' gurus for longer periods than those who are less satisfactory predictors. Gurus are thus self-

sustaining focal points. This simple notion captures many of the features of financial markets which are difficult to explain in more conventional terms.

8.2 The central bank as guru

Now, let us interpret Kirman's guru as the central bank. Hence, the focal point approach will offer a way to explain some particularly interesting stylized facts about nominal prices. The actions that central banks take, and indeed the announcements they make, in order to achieve some goal for the monetary policy, is granted a lot of attention from the financial market participants as well as from the media. If we combine this observation with the fact that we have not seen either the central bank or money play any role in the price level determination so far, we would have a puzzling observation. However, if we assume that central banks might be focal points for inflation (and short interest rates), we are able to explain: *(a)* why the market pays attention to central bank(ers), *(b)* why central banks strive to receive as much attention as possible when they change their interest rates or publish inflation forecasts - the difference compared with other banks or forecast agencies is significant - and *(c)* why the central bank most often makes very small changes in its interest rate, often as small as a quarter of a percentage point, although the inflation rate is far away from the target.¹⁰ Our answer to *(a)* is that the central bank acts as a focal point for expectations of inflation and nominal interest rates. Our answer to *(b)* is that the central bank has a goal for the inflation and has to make the market believe in it in order to attain it. Finally, our answer to *(c)* is that, in the language of Kirman, the central bank must defend its position as guru in the forecasting business, and consequently can not afford to be too wrong too often. It faces a trade-off between moving as fast as possible towards its target and preserving its focal point status.

We have argued that it would explain some puzzling observations if central banks were indeed focal points. Now, are there any particular reasons why the central bank would be a reasonable focal point for short-term interest rates, or inflation? My answer is clearly positive, agents have to base their expectations on historical events, and thus a long success record (or at least a long presence in the business) should be important. In this respect, the central bank has an obvious advantage over the vast majority of other forecast agencies. An additional fact that may give the central bank an advantage is that before the removal of strong currency and credit regulations, it had actual power to affect nominal and real variables in the economy. This factor however, should decrease in importance over time. Furthermore, the central bank works hard to stand out from the

¹⁰ A phenomenon that is broadly recognized, see e.g. Goodhart (1998).

crowd. It surrounds itself with an air of power and eternity, manifested in impressive buildings in marble and granite, accommodating serious men in dark suits. Moreover, the central bank presents inflation forecasts in an almost ceremonial manner, sometimes manifested by changes in the operative interest rate. In recent years, the Swedish central bank has regularly gone on promotion tours in order to increase its media exposure and enhance the public's recognition of its endeavor to maintain a low and stable inflation rate. Lastly, and perhaps most importantly, the central bank is associated with power and the nation itself, for example the *Bank of England* or *Sveriges Riksbank* in Sweden – the latter directly calling for an association with the concept of *national standard*.¹¹ What forecast could be a more natural choice than The National Standard forecast?

We have suggested that the central bank is indeed a natural choice as focal point for future inflation. Its possible persistence as an important player for inflation determination rests, however, on its capability to remain a self-sustaining focal point, i.e. to be reasonably successful. To be successful is to keep the inflation rate close to the target rate, which is a task that the central bank can only achieve if it succeeds in convincing the market that the inflation rate will indeed stay close to the target. Whether or not central banks will continue to accomplish this mission is basically a matter of how good they are at rhetoric; the central bank's control of inflation is true as long as it is believed. In Bengtsson (2005), I build on from here and focus on the question what means central banks have to control inflation or interest rates. In short I find the focal point story more conceivable than the traditional story that derives central bank power from the monopoly of printing money.

9 Conclusions

In this paper, we have pictured a model of how inflation is determined in a decentralized market process where prices are set in both simultaneous and sequential contracts. We have pictured price setting as a coordination game without a dominant equilibrium in the long run. In the short run, it is straightforward since the already running, sequential contracts pin down the price level. In the long run, however, the coordination game is more subtle. With no dominant equilibrium, we can not from the strategic form of the game say that one expectation is better than another. On the other hand, leaving the blackboard we can for example argue that *if* the rate of inflation has been stable for a while, it would be reasonable to expect it to continue on roughly the same level. Generally, assuming that inflation is in fact determined in a coordination game as we argue here, we can draw upon observations from the real world and claim that whenever

¹¹ The, somewhat archaic, Swedish word for a national standard is “rikshälsare”.

inflation does not follow a random path, people do seem to follow some rule when predicting future price levels.

Following up the claim that people seem to follow some rule when predicting inflation, in the final section, we claim that this rule could be suitably described as a focal point. We try to defend this claim by exploring what it would mean to an agent to follow a focal point for inflation and arguing that this is consistent with observations of price-setting agents.

Our final suggestion is that the central bank provides the focal point for inflation in the western world today. Central banks are suitable focal points since they are both conspicuous and unique. Moreover, to view central banks as focal points for inflation helps to understand both the behavior of central banks and the attention the financial markets pay to central bank announcements, which otherwise are behaviors difficult to explain.

10 References

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