Financial Globalization and Monetary Policy

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Financial Globalization and Monetary Policy

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Abstract

Recently, it has often been argued that globalization eases the job of central banks as it helps to tame inflation. This is used to argue that central banks (particularly the ECB, referring to the objectives as laid down in the EU-Treaty) could or should reduce their efforts in the fight against inflation in favour of supporting the general economic policies of the governments. This paper is concerned critically with this argument. It points to the structural changes associated with globalization and to the corresponding increase in uncertainty by which the central banks are affected. As an example of this, the increase in financial volatility is analysed and explained as the result of optimal portfolio allocation, and its implications for monetary policy are discussed.

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Keywords: globalization, inflation, volatility, capital flows, forecast error, asset prices, monetary policy

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INTRODUCTION

Globalization is a widely used term, but is in fact rather vague. In the 1990s, it became a catch-all under which the ongoing trend toward a deeply integrated world economy with all its economic, political and even cultural dimensions has been subsumed (only the economic aspects of globalization are regarded in this paper). The increasing economic integration of the world economy is most visible in the growth of world trade relative to world GDP, and particularly in the tremendous growth of cross-border trade in financial assets. Advances in communications and information technology have been an extraordinarily important catalyst for the globalization process by permitting a quick and easy completion of international transactions both in goods and in financial assets. But the current wave of greater global integration and interdependence is by no means a new phenomenon. A period of impressive global integration has been witnessed before, at least for capital markets, just about a hundred years ago. A fundamental difference between both eras of financial globalization, however, is that in the first wave of globalization, international capital moved almost exclusively from rich to poor countries to finance long-term investments (‘development finance’), whereas today cross-border capital flows are primarily motivated by hedging and risk sharing (‘diversification finance’) (Obstfeld and Taylor 2002, p. 57). As opposed to the late nineteenth century, today, being a large creditor and simultaneously a large debtor is nothing unusual, at least not for the advanced industrial countries (consider the U.S.).

Whatever era of globalization is considered, the benefits of increasing integration of the world economy rest on the increasing degree of competition among firms, the international division of labour and on the internationally efficient allocation of capital (cf. IMF 1997, Citrin and Fischer 2000). Regarding the current wave of globalization, some benefits also rest on the increasing degree of competition among governments. It is argued that this latter competition forces governments to exercise greater fiscal discipline and ensures sound institutional and political frameworks, and thereby exerts a disciplinary effect on inflation (Wagner 2002a). This contended effect of globalization on inflation is analysed in chapter 2 of this paper.

Yet, globalization has also raised serious concerns. In particular, two problems associated with globalization are usually put forth (Masson 2001). First, it is maintained that globalization both raises domestic income inequality and contributes to a widening of the
discrepancy between living standards in advanced industrial countries and those in the developing countries. However, the theoretical and empirical foundations of these concerns are seriously questioned in the literature (see e.g. the discussion in Masson 2001). Second, it is argued that globalization promotes financial volatility. Openness to international capital flows and the international integration of financial markets not only have their benefits but also seem to make countries susceptible to rapid capital flow reversals. As the recent experiences of emerging market economies have shown, excessive international capital flows permit economic disequilibria or financial and balance of payments crises (some of them self-fulfilling crises unrelated to “fundamentals”) to develop and impair real economic activity by requiring large output adjustments when flows reverse.

The second of the above problems or concerns is dealt with in greater detail in chapter 3 of this paper against the background of the following argument. Recently, it has often been argued that globalization eases the job of central banks as it helps to tame inflation. This is used to argue that central banks (particularly the ECB, referring to the objectives as laid down in the EU-Treaty) could or should reduce their efforts in the fight against inflation in favour of supporting the general economic policies of the governments. This paper is concerned critically with this argument. It points to the structural changes associated with globalization and to the corresponding increase in uncertainty by which the central banks are affected. As an example of this effect of globalization, we explore the hypothesis that globalization increases international capital flow volatility, thereby contributing to higher asset price volatility on international financial markets. We interpret this result of our model as a systematic or structural change brought about by financial globalization.

We proceed in two steps in chapter 3. We start by presenting a model that explains the volatility of international capital flows as the result of optimal portfolio allocation. Rational forecast errors that investors make while processing new information can give rise to financial volatility unrelated to fundamentals. We then show that globalization works as a multiplier mechanism for the volatility of international capital flows since the sensitivity of international capital flows to changes in market sentiment increases. In globalized markets, changes in expected rates of return translate more easily into changes in cross border flows because deviations from the global mean in expected returns of assets are less tolerated. Forecast errors can thus produce larger swings in capital flows without fundamental reasons. In a

1 See, e.g., Obstfeld and Taylor (2002) and O’Rourke and Williamson (1999).
second step we explore the implications and consequences of these results for the conduct of monetary policy against the background that the increased volatility of international capital flows also implies a higher volatility of asset prices. In particular, we argue that inflation targeting might lose efficiency since the inflation forecast must be formulated in an environment of greater uncertainty. We further discuss whether macroeconomic performance can be improved by including asset prices in the monetary policy rule. Although some arguments can be advanced that support this reaction to the systematic increase in financial volatility implied by our model, the literature also provides equally powerful counterarguments so that unambiguous policy advice cannot be given.

The remainder of the paper is organised as follows. Section 2 first is concerned critically with the argument that globalization reduces inflation pressure and with the implications for monetary policy. It stresses that central banks are confronted not only with a reduction in inflation pressure but also with an increase in uncertainty associated with the structural changes that go along with globalization. Section 3 analyses such an uncertainty-enhancing phenomenon, namely the increase in financial volatility and discusses how the conduct of monetary policy is affected by this development. Section 4 concludes.

2 INFLATION EFFECTS AND MONETARY POLICY IMPLICATIONS

An important outcome of the increasing economic integration of the world economy (called globalization) is that it increasingly exposes private agents and governments to international competition.

We can differentiate between different levels or fields of competition.

- In the private sector (on a microeconomic level), global economic integration, which is effective not only on the financial, but also on the goods and labor market, leads to lower price markups and lower excess wage. “The disciplining effect of global financial markets applies ... also to the private sector, by making it more difficult to sustain unwarranted price markups and nonproductivity driven wage increases” (Citrin and Fischer 2000, p. 27). This effect of globalization, however, will tend to result in one-time downward shifts in the price level rather than ongoing restraints on the rate of inflation.

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2 This chapter briefly summarizes the arguments derived in Wagner (2002a).
In the state sector (on a macroeconomic level), global economic integration leads to new, fiercer competition on the world market as new countries (competitors) enter the global market. The increased openness to trade and capital flows, based on liberalization and deregulation, particularly on the financial markets, increases the locational or infrastructural competition between regions and countries. This in turn forces governments to reduce inefficiencies.

This chapter focuses on this locational competition (the competition in the state sector) since this type of competition tends to result in ongoing restraints on the rate of inflation rather than only one-time downward shifts in the price level and therefore has more significant implications for monetary policy.

### 2.1 ON THE CONCEPT OF LOCATIONAL COMPETITION AND ITS IMPLICATION FOR GOVERNMENTS

Locational competition means that countries and regions have to provide good infrastructure (better infrastructure than competing countries or regions) to attract mobile production factors. Good infrastructure increases the incentive for foreign direct investors to invest in this country or region and improves the chances of domestic firms attracting foreign mobile production factors or keeping their own productive factors from moving outward. Here various so-called locational or infrastructural factors matter, for example on the national level: legal security (property rights, contract enforcement), social security, economic and political stability; and on the regional level: cultural offers or infrastructure, housing, roads, safety etc.

In this paper, we concentrate on macroeconomic stability as a key locational factor on the national level. Major indicators or signals of macroeconomic (in)stability are inflation, debt and tax burden (Fischer 1991).

By reducing these undesired macroeconomic factors to a level which is lower than in competing locations, governments can try to attract mobile capital from other locations and to keep domestic mobile capital (human capital as well as financial and real capital and investment) from moving outward into other countries or regions. In other words, globalization induces stronger locational competition between countries or regions for mobile capital. 

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3 However, the domestic firms also have to fulfil their own part of the task insofar as they have to supply (comparatively) attractive work conditions and remuneration.

4 On the concept of “locational competition” (Standortkonkurrenz) see in more detail Siebert (1996).
It is known that governments have an important role to play in creating the conditions that attract foreign direct investment (FDI) and in maximizing the positive contribution that FDI can make to growth and development (UNCTAD 1999). Globalization in the above sense forces governments to exercise greater fiscal discipline and to ensure sound institutional and political frameworks. In other words, it does “act as a force for stability by limiting the scope for countries to pursue policies that are incompatible with medium–term financial stability” (Citrin and Fischer 2000, p. 27). Thus, governments feel pressured by the (globalization-driven) locational competition to promote international competitiveness through macroeconomic stability particularly by lowering taxes, government debt, and inflation.

In the following, we concentrate on the effects of (financial) globalization on inflation, as inflation is the main target variable of monetary policy. We argue that, in consequence of financial globalization, locational competition tends to reduce inflation pressure over the medium term.5

Besides, another channel, through which real globalization affects inflation, has been discussed in recent years. The recent literature has identified openness as one of the countervailing forces that lessen the incentive to inflate. The argument which is originally due to Romer (1993) is that, the more open the economy, the smaller the real benefits of higher output from surprise monetary expansion, and thus the lower the equilibrium rate of inflation. As domestic output increases, the terms of trade worsen: the more open the economy, the larger the fraction of foreign goods in domestic consumption, and the greater the welfare loss from the terms of trade loss. In short, more open economies may be blessed with a lower incentive to inflate.6 We shall briefly sketch this argument in the appendix, however concentrate in the following on analysing the first channel.

5 See also Citrin and Fischer (2000) who argue that an aspect of globalization that is “likely to have a long-lasting influence on inflation is the discipline on domestic financial policies imposed by increased financial market integration” (p. 26).

6 Lane (1997) showed that the prediction that more open economies have lower equilibrium inflation rates is true independently of the terms of trade mechanism emphasized by Romer (1993). The mechanism linking the welfare effects of monetary surprises, and hence the incentives to inflate, to openness does not depend on a large-country terms of trade effect but rather is due to imperfect competition and nominal price rigidity in the non-traded sector.
2.2 EFFECTS ON INFLATION

Theoretical and empirical research has shown that (high) inflation is an undesirable locational factor and a locational disadvantage in a globalized world. Inflation is regarded as a signal of bad policy and political and economic instability. As bad policy and political and economic instability are relevant locational factors or disadvantages, this contributes to capital flight in a globalized economy. The costs of a capital drain stem from the fact that investors and (productive) mobile factors are the basis of economic growth. When firms and mobile capital leave the country (or region), this means a loss of (potential) production, a decrease in the (potential) output, an increase in unemployment and a decrease in productivity (particularly if, as is often the case, the most productive factors and the most innovative investors are the most mobile ones). This tendency for capital flight in the case of bad locational factors (such as high inflation) is stronger, the higher the integration and globalization of the financial markets is. By contrast, the host country (recipient) profits from attracting foreign mobile capital. It profits from technology transfer, because foreign direct investment (FDI) allows the labour force in the host country to become better trained, and from profits and tax revenues.

Inflation, however, works like taxation. The real effective capital income tax rate rises as inflation increases. The effects on capital income taxes are a main mechanism by which the tax system becomes non-neutral to inflation. Here, however, we have to differentiate between the short term and the long term. (Physical) capital can be withdrawn from one use, and directed toward another, only gradually. The fact that capital is thus not very mobile in the short term means that capital income can be a target for redistributive policy. Inflation or expansionary (inflation-producing) policy, can be looked at in the same way. That is, inflation can be regarded as a form of source-based capital income tax. Over time, however, when there are not favourable conditions, capital flows out of the jurisdiction, causing labour productivity and income to fall. That is, inflation may not only be regarded, as economic

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7 See for example, Shiller (1997) and Mankiw (1999). In addition, it is often believed that (high) inflation may reduce economic growth, even though previous empirical evidence that links inflation with overall economic performance is not particularly robust.

8 See chapter 3 below.

9 See, e.g., Feldstein (1999).
theory suggests, as a phenomenon that leads to misallocation of resources, but it may also reduce economic growth.\textsuperscript{10}

Therefore, governments, unless they are very myopic, when deciding about structural priorities, will consider the costs of a capital drain and of not being able to attract foreign capital which functions as a source of financing investments and economic growth. But it may be argued that governments and politicians are myopic and therefore, as long as (physical and human) capital is not very mobile in the short term, will tend to neglect this aspect. However, the possibility and attractiveness for capital to fly or move to other locations tends to increase with the degree of international capital mobility, i.e. financial integration. In other words, financial globalization reduces the term during which capital is not very mobile. Hence one can expect that gradually, with the increase in financial integration, even myopic politicians will soon attach greater importance to the target of preventing inflation. They will then show more fiscal discipline insofar as, when adverse demand shocks occur, they produce less conflicts with monetary authorities about releasing monetary restrictions set up to prevent inflation.

This insight (and the consequent change in behaviour) has found expression in the willingness of numerous governments all around the world to provide their central banks with greater legal independence. This trend towards increased central bank independence that has been witnessed in both industrialized and developing countries\textsuperscript{11} can be regarded as the most important inflation-decreasing effect of locational competition.\textsuperscript{12} This locational or institutional competition, which was described above as a characteristic or implication of globalization, tends to make institutions such as central bank independence into a “must” for a government in order to be able to sell bonds on the international financial markets, at least at a “reasonable” price.

\textsuperscript{10} Moreover, increasing factor mobility tends to limit the effectiveness and the attractiveness of redistributive, inflationary policies (Wildasin 2000).

\textsuperscript{11} Within the former socialist countries of Central and Eastern Europe, economic transition has also been accompanied by substantial central bank reforms granting greater ‘goal’ and ‘instrument’ independence. In these countries, however, the question sometimes arises whether the delegation of independence to the central bank is actual or only legal (see Cukierman 1998, and, for the implications, Wagner 1999).

\textsuperscript{12} There is extensive empirical evidence suggesting that central bank independence helps to reduce inflation. For a survey of recent research on central bank independence see, e.g., Kißmer and Wagner (1999), and Berger, Haan and Eijffinger (2001).
Correspondingly, one may assume that globalization will reduce inflation and, therefore, the conditions for price stability policy become more favourable. However, the above argument also suggests that the increase in the costs of inflation (which is the trigger for the disciplinary effect of financial globalization on inflation) represents an effect that takes place only with a delay. We have emphasized that (physical) capital can only gradually be withdrawn from one use and directed toward another. In other words, it takes time for the costs of a capital drain and the consequent loss of output to occur and before the pressure is put on a government, forcing it to introduce reform measures in order to reduce these costs.

Inflation itself can be understood as the result of inefficient structural conditions. These inefficiencies, which supposedly can only be reduced by (costly) structural reforms, may be considered to be the consequence of a (rational) delay of reforms. Therefore, inflation itself (as well as the other locational hindrances mentioned) can be regarded as the consequence of a delay of (or failure to) reform.

The macroeconomic effects of the increase in the costs of inflation caused by globalization can be modelled in different ways (see Wagner 2002a). In the appendix, we describe a model in which these costs are integrated into the supply curve of the basic model (see equations (2) and (8) in the appendix) by arguing that the costs of a delay of reforms and of reform unwillingness increase. Here we have to consider that there are costs of implementing reforms.14

2.3 MONETARY POLICY IMPLICATIONS

The above arguments support the view that globalization tends to reduce inflation. Therefore, globalization appears to improve the conditions for maintaining price stability and thereby to ease the job of central bankers. However, there are caveats with this conclusion.

First, the conclusion that globalization reduces inflation is not generally true. In the model demonstrated in the appendix it can be seen that there is even the possibility that, under

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13 See Wagner (2000a). This can be traced to a failure to make reforms in areas such as labour market rigidity, or financial and monetary policy aspects, for example inappropriate taxation and government debt or central bank dependency.

14 In the appendix, we first derive the basic model, briefly elaborate the Romer effect, and then develop the model that supports the above argument.
certain circumstances, globalization produces the opposite result. This is based on the costs of reforms.

Second, there are trade-offs between different locational goods that a country or government tries to attain. For example, high fiscal burdens (direct tax load and indebtedness) have also to be considered as typical negatively rated locational factors in the locational competition between countries or governments. Moreover, it is not only taxes, expenditures and debt that are important locational factors in the competition for direct international capital investments; another important locational factor is the infrastructure, which includes physical goods such as roads, ports and telecommunications, institutional conditions such as property rights, contract enforcement and, last but not least, educational goods (a minimum threshold level of skills is needed to attract inward investment). This trade-off situation may result in a stronger pressure on the central bank to allow for an increase in the share of seigniorage (beyond the optimal share of seigniorage that may also rise) in financing government expenditures (see, in more detail, Wagner 2002a, pp. 28-30). Therefore, there is no reason for central banks to conduct the price stability task under globalization more laxly (or even for the government to reduce the degree of central bank independence).15

Third, when globalization is believed to suppress inflation pressures, it is more tempting for specific social interest groups to pressure the central bank to reduce its efforts in the fight against inflation in favour of the fight against (for example) unemployment or economic recession. However, there are some pitfalls if the central bank gives in to this pressure. For example, central banks can be fooled by their own credibility for low inflation (based, for example, on the increase in competition induced by globalization described above) into being insufficiently pre-emptive in a business expansion (Goodfriend 2000). In the belief in the

15 In this context, it has to be considered that globalization itself is a controversial process in the eyes of the public. Depending on their starting conditions, globalization forces open economies to implement structural reforms, not only in the financial but also in the goods and labour markets, and last but not least in the public sector. These reforms produce asymmetric costs for different social groups. This is likely to induce resistance to the reforms and the globalization process in general. In order to avoid a backsliding into isolation, this may force some governments to compensate the social groups that are hurt by the reforms, by social-political measures which are costly. Hence, if not blessed with higher tax revenues from an increase in productivity and thereby in economic growth (‘New Economy-effects’ of globalization), such societies run into a target conflict because the social-political measures have to be financed, either by an increase in taxes or indebtedness, or by an increase in seigniorage (if not by a reduction in other expenditures). All of these alternatives are locational bads in the international competition process. In other words, the increase in competition, and the globalization process (which we argued to be the basis for this increase in competition and thereby for a decline in inflation), do not automatically or inevitably last in the long term (see O’Rourke and Williamson (1999) for an analysis of the decline of the so-called first wave of globalization a century ago.) They have to be accompanied by permanent efforts to defend and continue to undertake painful structural reforms.
inflation-suppressing power of this competition, central banks may be inclined to delay monetary tightening when the economy moves beyond a presumed level of non-inflationary potential output. If, however, the economy continued to run above potential, the credibility for stable prices would, at some point, self-destruct. This would create a jump in inflation, so that the central bank would then be forced to react with tighter monetary policy. It would produce, what is often called a ‘hard landing’ for the economy. The outbreak of inflation would destroy a kind of implicit reputational equilibrium in which price and wage setters kept their part of an implicit bargain, which means that they did not inflate as long as the central bank (or the globalization-driven competition) was expected to maintain its commitment to price stability. An obvious conclusion to draw is that a central bank should be sufficiently pre-emptive in a boom (see Goodfriend 2000). An additional, similar and perhaps even more important argument, which is analysed in chapter 3 below, refers to the danger of central banks neglecting, and hence not constraining bubble effects.

Fourth, and most important, the many structural changes that are associated with the globalization process cause an increase in the number and extent of disturbances and hence increase the uncertainty surrounding monetary policy. On the one hand, they lead to an increase in uncertainty about how to interpret macroeconomic data/indicators (and hence the current/approaching state of the economy). This is partly due to time lags in acquiring reliable data after structural shocks (incompletely foreseen structural changes) and the associated problem of data corrections. On the other hand, the structural changes lead to an increase in uncertainty about how the policy instruments affect inflation and economic activity (i.e., the transmission mechanisms). This is due particularly to the heterogeneity of structures and policy transmission mechanisms among different countries, where the number of countries that are interlinked with each other and affected by the actions and developments in the other (partner) countries increases with the ongoing globalization process. Not only does the number of interlinked countries increase, but the intensity or extent of exchange and dependency also rises.16

From this we can conclude that uncertainty increases. However, one may point out that real globalization will have the effect that social-political structures and social behaviour become/s more similar all over the world so that structural uncertainty for internationally acting investors and politicians should rather decrease instead of increase. This is correct if one looks
at globalization in a comparative-static way, that is at how globalization in the end will change the world. This process, however, is a long-enduring process. Here, we look at globalization as an ongoing dynamic process. In other words, we look at the trajectory. During this long-term adjustment process, however, uncertainty\textsuperscript{17} increases, as new structures have to be learned or get familiar with. Hence, changes in and adaptation of social structures, and hence of transmission mechanisms, is a long-term process.

This issue has been examined in more detail in Wagner (2002a), therefore we shall restrict ourselves to some summarizing statements. In the context of a Taylor rule, the uncertainty about the output and inflation gaps, as well as the uncertainty about the monetary transmission mechanism and hence about the optimal reaction parameters, increase.

With respect to the uncertainty about the output and inflation gaps, two aspects in particular are highlighted in Wagner (2002a). On the one hand, the structural changes associated with the globalization process increase the uncertainty with respect to productivity growth (and hence potential output), and, on the other hand, they decrease the information content of the price level. Both effects increase the uncertainty about the output gap and the inflation gap.

With respect to the uncertainty about the monetary transmission mechanism, one can refer to the new technology of e-money. The increasing use of e-money clouds the significance of conventional monetary aggregates. When the significance of conventional monetary aggregates weakens, the central bank becomes more uncertain about the monetary transmission mechanism, i.e. about how the monetary instruments affect inflation and economic activity, in terms of both size and timing.

Furthermore, as argued above, ongoing globalization implies that the degree to which individual national economies are dependent on the developments in other countries increases. Not only are they increasingly dependent on traditional trading partners, new partners also appear. The new partners arising out of the globalization process, however, have different economic, political, social and cultural structures that are incompletely known to the home country’s inhabitants. Therefore, the transmission mechanisms of national economic

\textsuperscript{16} This will be analysed in more detail in chapter 3.

\textsuperscript{17} Importantly, this uncertainty is structural uncertainty and would have to be modelled as multiplicative or parameter uncertainty and not just as additive uncertainty.
policies will not only change but also become more uncertain because of the home country’s
increased dependency on and the corresponding (uncertain) feedback from structural and
policy changes in these other countries.

Therefore, it can be assumed that globalization increases the complexity of the real economy
and, as a consequence, transitorily the central bank has less understanding of the economic
structure in which it acts. That is, if the ongoing structural change surrounding globalization is
going to change the economic structure (in which the central bank acts) itself, the model
uncertainty of the central bank will increase. The question, then, is what consequence this
would or should have for monetary policy. The research on this issue, however, has only just
begun (see Taylor 1998, Sargent 1999, Hansen and Sargent 2000), and no clear academic
consensus has yet been reached.\footnote{The traditional monetary policy implication that is drawn from such an increase in uncertainty is that monetary policy should concentrate on its main task, and this is increasingly assumed to be price stabilization (or prevention of inflation). Furthermore, when uncertainty about the significance of the indicators and the transmission mechanism of monetary policy increases, the conventional lesson derived from the Brainard rule (1967) tells us that the central bank should become more cautious and thus less active. However, it is known that ‘Brainard’s conservatism principle’ is not universally robust, but depends upon the exact form of parameter uncertainty. Recent literature has emphasized circumstances in which parameter uncertainty should lead policymakers to vary their policy instruments more than would be optimal in the absence of such uncertainty, see Smets (1998), Giannoni (1999), Onatski and Stock (1999), Lansing (2000), Meyer, Swanson and Wieland (2001). However, the research on this issue has also only just begun and no clear academic consensus has yet been reached.}

All these aspects indicate that, even if globalization reduces inflation pressure (over the
medium term), the task of the central banks to maintain price stability is not going to become
easier, particularly as uncertainty about the development of the economic structure in which
they act is likely to increase at the same time. One of the uncertainty-enhancing effects of
globalization, namely the increase in financial volatility observed over recent years, and its
implications for monetary policy, are analysed in the following chapter.
3 EFFECTS ON FINANCIAL VOLATILITY AND IMPLICATIONS FOR MONETARY POLICY

Maintaining price stability (or stabilizing the inflation rate at a certain low level) over either the short or medium term is the main objective of most of today’s central banks. This is particularly the case for the ECB. However, even with respect to the ECB, it is not the only objective. The objective of helping governments to stabilize the real economy and/or the financial market is usually also allotted to a central bank.19 Even in countries where the central bank is not assigned with this additional objective, it has to take into account that instability in the real sector and the financial markets impacts on inflation and it has to be asked how then to maintain price stability. Therefore, the questions of how financial globalization affects financial market volatility and what implications this has for monetary policy, should be a matter of major strategic interest to each central bank. These issues are examined in this chapter.

3.1 A MODEL OF FINANCIAL VOLATILITY

International capital flows proved to be extremely volatile in the recent past. In particular, emerging market financing has been subject to pronounced boom-and-bust-cycles in the recent past. While FDI flows rose quite steadily in the 1990s, portfolio (equity and bond) and banking flows have been very volatile and susceptible to sharp reversals (see Sarno and Taylor 1999). Moreover, the recent crises in Asian and Latin American emerging markets demonstrated that market sentiment may shift from optimism to scepticism without a deteriorating change in fundamentals (cf. e.g. Ahluwalia 2000, Baig and Goldfajn 1999, Eichengreen and Mody 2000, Kaminsky and Schmuckler 1999, Levy-Yeyati and Ubide 2000).20 The globalization of financial markets is seen as a key culprit behind the marked volatility of cross-border capital flows (Masson 2001). Calvo, Leiderman and Reinhart (1996, p. 127) point out that on highly globalized and technologically sophisticated financial

19 The EU-Treaty says: “the primary objective of the ESCB [European System of Central Banks] shall be to maintain price stability. Without prejudice to the objective of price stability, it shall support the general economic policies in the Community” (Protocol (No. 18) on the Statute of the European System of Central Banks and of the European Central Bank, Chapter II, Article 2).

20 Empirical studies (e.g., Calvo and Reinhart 1996, Hernández, Mellado and Valdés 2001) show that international capital flows are in part driven by herd-like behaviour and contagion effects unrelated to economic fundamentals.
markets, portfolio flows in particular „… can easily be altered or withdrawn with little more than the flick of a computer key.”\textsuperscript{21}

In this section we examine these observations formally within a model of portfolio selection. We do not intend to present an innovative framework but aim at giving an insightful analysis with the help of a simple model. We start from the idea that the transmission of information in international financial markets is subject to frictions. Market participants are only imperfectly informed and have to extract the relevant pieces of information from a noisy signal before allocating their wealth across countries. The signal tells them whether country specific fundamentals are sound so that the expected return of an investment is high or whether the economy is in rather bad shape and the prospects for investment in the country under consideration are accordingly bad. But since the signal is noisy, it only imperfectly reveals the true fundamental state. Investors use it, however, to rationally update their priors about the state of the economy. Although all available information is taken into account rational forecast errors that give rise to large swings in capital flows might result. Thus, capital flows may be more volatile than is justified by fundamentals and insofar, display excessive volatility. In a second step we examine the effect of the ongoing globalization process on financial volatility. We demonstrate that financial volatility is exacerbated the further globalization progresses because new information produces larger swings in capital flows if investors are highly diversified. Therefore financial volatility increases in globalized markets.

Our model is related to the recent work of Chari and Kehoe (2001) and Calvo and Mendoza (2000).\textsuperscript{22} We follow Calvo and Mendoza (2000) in explaining financial volatility as an outcome of market participants’ optimal portfolio diversification. In Calvo and Mendoza’s model investors may have no incentives to pay a fixed cost for information about a country’s fundamentals but react to credible rumours instead. Thus, a country may be confronted with a massive capital outflow even though its fundamentals are unchanged. Chari and Kehoe (2001)

\textsuperscript{21} The model of Berger and Wagner (2002) implies that the enhanced economic interdependence of countries in globalized markets also contributes to an increase in capital flow volatility. It shows that the exchange market turmoil of one country spreads to several others through trade links and may even trigger self-fulfilling crises there.

\textsuperscript{22} We only cite these two studies because our model shares some features with both of them. For other complementary literature see the recent work on financial crises and contagion, e.g. Allen and Gale (2000a, b), Calvo (1999), Chang and Velasco (2001), Kodres and Pritsker (2002) and Lagunoff and Schreft (1999).
present a model in which information cascades give rise to herding. Investors sequentially decide to invest in a country or to refrain from investing. Sequential decision-making allows each investor to observe the actions of the investors ahead of him. Therefore the investment decisions of investors therefore not only rest on their private information – which may turn out to be wrong - but also on the information they infer from other investors’ actions. It may now be rational to ignore one’s own private information and imitate the behaviour of those investors who acted first. If the investors who are the first in line invest, all others do the same regardless of their private information. However, if the first investors decide to withhold their funds, the capital inflow will come to a sudden stop because all others will ignore their own signals even if it tells them to invest. Hence, the outcome, i.e. the direction in which the herd runs, critically depends on the behaviour of the investors acting first. Tiny changes in their private information can thus lead to a complete reversal of capital flows even though the economy’s fundamental state has not necessarily changed. Therefore, capital flows can be more volatile than justified by fundamentals.

Our model shares some features with both Chari and Kehoe’s (2001) and Calvo and Mendoza’s (2000) models. In our model the updating of investors’ information is the reason for financial volatility. Insofar our approach is close to Chari and Kehoe’s model in which the volatility of cross-border capital flows is also generated by the rational processing of information. Chari and Kehoe’s model suffers from the drawback that agents can only make zero-one decisions, i.e. they have the choice between investing a fixed amount or not investing at all. To allow for continuous investments we embed investors’ information updating into the optimal portfolio diversification of utility-maximizing market participants. In accordance with Calvo and Mendoza’s models (and in contrast to Chari and Kehoe’s approach) our model relies upon mean-variance portfolio diversification and features


24 The signal extraction problem in Chari and Kehoe’s model is much more elaborate than portrayed in our short summary. Besides the signal about the fundamentals the investors’ priors about the government’s competence also play a role for the investment decisions because an incompetent government is more inclined to default on the economy’s debt than a competent government.

25 This feature of Chari and Kehoe’s model is typical for the game-theoretic approach to herding following the work of Banerjee (1992) and Bikhchandani, Hirshleifer and Welch (1992). In Chari and Kehoe (2000) this and other assumptions are relaxed and it is shown that herding is robust to their relaxation.
homogenous agents who simultaneously make their investment decisions.\textsuperscript{26} Moreover, like Calvo and Mendoza, our model shows that financial volatility increases in globalized markets.

In subsection 3.1.1 a model explaining capital flow volatility as the result of rational forecast errors is outlined. In subsection 3.1.2 the effect of globalization on financial volatility is examined. In subsection 3.1.3 some implications of our model are discussed.

\section*{3.1.1 VOLATILE MARKET SENTIMENT: THE ROLE OF EXPECTATIONS}

We consider a large number of identical risk averse international investors who have only imperfect information about country specific fundamentals when they decide about their portfolio allocation. Before the representative investor makes his investment decisions he receives a noisy signal, denoted by $v$, about the fundamentals of a country $A$.\textsuperscript{27}

\begin{equation}
(1) \quad v = z + u.
\end{equation}

$z \in \{z_b, z_g\}$, $z_b > z_g$, is the parameter investors want to know. $z$ conveys the true information about the fundamentals. For simplicity country $A$ can only be in two fundamental states. $z_g$ means that sound fundamentals prevail in country $A$, while $z_b$ refers to the case of weak fundamentals. Against this background, $v$ can be interpreted as a rumor telling that country $A$ approaches a crisis. Hence, we will sometimes refer to $z_g$ as the ‘normal state’ and call $z_b$ a crisis.

The information about country $A$’s fundamentals that the representative investor gets is distorted by a shock $u$, $E_{t-1}(u_t) = 0$, so that investors cannot infer directly the true value of $z$ from the signal. But as they know the probability density function (p.d.f.) of $v$ and the

\begin{itemize}
\item \textsuperscript{26} Calvo and Mendoza (2000) point out that sequential decision-making does not seem to describe the financial markets in times of stress, i.e. when it comes to massive simultaneous sell-offs, very well.
\item \textsuperscript{27} In our model the market’s perception of country-specific fundamentals is the only determinant of cross-border capital flows. Beside this internal factor, factors external to the recipient economies like the fundamentals in the major developed countries also play a role for international capital flows (Calvo, Leiderman and Reinhart 1996).
\end{itemize}
possible realizations of \( z \), they are able to rationally update their prior \( \lambda_0 \) that \( z = z_b \). They do this by forming the a-posteriori probability \( \lambda_1 \) according to Bayes' law.

\[
\lambda_1 = \frac{\lambda_0 \Pr(b|z_b)}{\lambda_0 \Pr(b|z_b) + (1 - \lambda_0) \Pr(b|z_g)}.
\]

If investors receive a signal for which \( \Pr(b|z_b) > \Pr(b|z_g) \) holds, the subjective probability of the market that \( z = z_b \) increases, i.e. \( \lambda_1 > \lambda_0 \). A sufficiently high value of \( v \) has this consequence. As the information about \( z \) is distorted by \( \nu \), (rational) forecast errors might result.\(^{28}\) This is the case if the market’s probability that \( z_b \) is true increases only because the signal \( v \) is heavily distorted by a large realization of \( \nu \). I.e. the market’s conviction that country A actually has weak fundamentals (crisis state) grows although \( z_g \) is actually the true value of \( z \).\(^ {29}\) Forecast errors like this establish the basis for capital flow volatility without fundamental reasons.

The rational processing of information via Bayes' law is now introduced into the portfolio allocation problem of the representative international investor who is assumed to have one unit of wealth. Each investor has to decide how to optimally divide his portfolio between country (asset) A and \( J \) identical countries ("world fund"), where \( J \geq 1 \). We assume that asset returns are uncorrelated.\(^ {30}\) The return in the \( J \) identical countries is normally distributed, \( r_i \sim N(\rho, \sigma^2) \), \( i = 1, \ldots, J \).\(^ {31}\) The p.d.f. of the return in country A depends on the true value of \( z \). It is assumed that the return in country A is also normally distributed no matter which

\(^{28}\) Lewis (1989a, b) analyses systematic forecast errors due to learning and shows that they are consistent with the rational expectations paradigm.

\(^{29}\) If the signal \( v \) was repeated infinitely, investors would of course be able to infer the true value of \( z \); \( \lambda_1 \) would converge to zero or to one.

\(^{30}\) It may be objected that the zero-correlation assumption of our model is inadequate as globalization usually is referred to as increasing the correlations across international markets. However, our model aims at highlighting another indicator of globalization. Here, globalization is understood as a process that expands investors’ opportunity set. In an empirical study Goetzmann, Li and Rouwenhorst (2001) conclude that in the last two decades the expansion of the opportunity set for investors due to the integration of emerging markets into the global financial system (and not the global market correlations) was the main reason for the benefits of global investing. To clearly work out the implications of this development we abstracted from other effects of globalization on financial markets by assuming zero correlation between assets.

\(^{31}\) Of course, the share of the identical countries in the portfolio will be identical in equilibrium since they follow identical distributions.
fundamental state (crisis or ‘normal’) prevails. But the mean of country A’s p.d.f. varies with the fundamentals, i.e. \( (r_A | z_b) \sim N(0, \sigma^2) \) and \( (r_A | z_g) \sim N(\tau, \sigma^2), \tau > 0 \). \(^{32}\)

With the help of these p.d.f.s we can formally derive the forecast error that gives rise to excessive financial volatility. \(^{33}\) Suppose that \( z_g \) correctly describes the fundamental state of country A. To calculate the forecast error, \( \Phi \), the expected return in country A conditional on a given signal \( v \) is subtracted from the realized return, which we denote by \( \hat{r}_A \).

\[
(3) \quad \Phi = \hat{r}_A - (1 - \lambda_1)\tau = \Phi^u + \lambda_1 \tau.
\]

The forecast error, \( \Phi \), can be separated into a systematic and an unsystematic part. The unsystematic forecast error is defined as \( \Phi^u = \hat{r}_A - \tau \) and equal to zero on average. In addition agents make a systematic forecast error as long as \( \lambda_1 > 0 \). The systematic forecast error, \( \Phi - \Phi^u = \lambda_1 \tau > 0 \), which is on average greater than zero, is responsible for a systematic deviation of \( \Phi \) from zero and thus a volatility of international capital flows unrelated to economic fundamentals.

The expected utility of each investor can be expressed by using the mean-variance-utility function in equation (4). \(^{34}\)

\[
(4) \quad u(\Theta) = \mu_p(\Theta) - \frac{\gamma}{2} \sigma_p^2(\Theta).
\]

\( \gamma \) is the coefficient of investors’ absolute risk aversion and \( \Theta \) denotes the portfolio share allocated to country A. \( \mu_p \) and \( \sigma_p^2 \) represent the expected return and the risk of the portfolio as a function of \( \Theta \).

---

\(^{32}\) Note that for the international investors only the variable \( z \), which denotes the fundamental state of country A has a bimodal distribution. The asset return, however, is normally distributed in any case (a prerequisite for using the mean-variance utility function in equation (4), see fn. 34).

\(^{33}\) See Lewis (1989a, b) for a thorough derivation and interpretation of forecast errors in learning.

\(^{34}\) As is well known, the utility function (4) can be derived from a standard exponential utility function with constant absolute risk aversion if the return is assumed to be normally distributed.
Since investors are uncertain about the true fundamental state, their expected utility, \( EU(\Theta) \), is a weighted average of their expected utilities for \( z = z_g \) and for \( z = z_b \), respectively. Accordingly, investors’ expected utility \( EU(\Theta) \) can be formulated as follows:

\[
EU(\Theta) = (1 - \Theta)p + \Theta(1 - \lambda_1)\tau - \frac{\gamma\sigma^2}{2} \left[ \frac{(1 - \Theta)^2}{J} + \Theta^2 \right].
\]

The portfolio diversification that maximizes expected utility is defined by \( \Theta^* \), i.e. the share of the portfolio optimally invested in country (asset) A.

\[
\Theta^* = \frac{1}{J + 1} \left[ 1 + J \frac{(1 - \lambda_1)\tau - p}{\gamma\sigma^2} \right].
\]

It is assumed that \( 0 \leq \Theta^* \leq 1 \), i.e. short sales are ruled out for simplification.

The share of the optimally diversified portfolio that is invested in A varies with the market probability \( \lambda_1 \). An increase in \( \lambda_1 \) leads to a fall in \( \Theta^* \) because the market assesses the investment prospects in country A as increasingly gloomy. Hence, the stronger the signal suggests weak fundamentals in country A (i.e. the higher is \( \lambda_1 \)), the more the share of the portfolio allocated to country A is reduced.

### 3.1.2 CAPITAL VOLATILITY AND THE INTERNATIONAL INTEGRATION OF FINANCIAL MARKETS

The effect of the signal \( v \) on the international capital flows depends among other things on the number of assets available. The number of countries an international investor can invest in is interpreted as an indicator for the state of the globalization process in this model. The higher is \( J \), the further the globalization of financial markets has progressed. Since we ruled out short selling optimal portfolios may be the corner solutions \( \Theta^* = 0 \) or \( \Theta^* = 1 \).\(^{35}\) Now, we will

\(^{35}\) The corner solutions imply that there are assets no international investor wants to hold. To ensure that supply meets demand, we assume that risk-neutral domestic investors hold these assets when the international investors
show that the probability of interior solutions for the optimal portfolio shrinks as markets grow.

International investors optimally realize $\Theta^* = 0$ as a reaction to a given signal as soon as $\lambda_1$ reaches the threshold value $\lambda_1^{\text{max}} = 1 - \frac{\rho}{\tau} + \frac{\gamma \sigma^2}{J}$. $\lambda_1^{\text{max}}$ falls if the number of internationally traded assets, $J$, rises, e.g. as a consequence of an increasing integration of emerging markets into the international financial system. The expected return that corresponds to $\lambda_1^{\text{max}}$ and that is necessary for a minimum capital inflow rises accordingly and converges to the expected return in all other identical countries $\rho$.

The more assets are internationally available, the less tolerant are investors towards deviations of the expected return in a country from the globally expected return. Regarding the extreme case of an infinite number of assets, investors optimally neglect a country’s asset as soon as its expected return only marginally falls short of the globally expected return. The basic reason for this result is that the risk of the world fund falls if the number of assets that are included rises. The inverse relationship between the risk of the world fund and the number of assets it comprises is reflected in the fact that the variance of the world fund, $\sigma^2/J$, falls if $J$ rises. If $J$ becomes infinite, the world fund becomes a riskless asset so that it is optimal for investors to dispense with assets that do not have an expected return of at least $\rho$. This result already indicates that the ongoing globalization process promotes financial volatility. The more countries are willing to open their financial systems and reap the benefits of international capital account liberalization, the more severe are the effects of weak changes in market sentiment.

Just as for $\lambda_1^{\text{max}}$, the value of the a-posteriori probability that leads to the corner solution $\Theta^* = 1$ can be calculated. Imposing $\Theta^* = 1$ on equation (6) yields $\lambda_1^{\text{min}} = 1 - \frac{\rho}{\tau} + \frac{\gamma \sigma^2}{J}$. If $\lambda_1 \leq \lambda_1^{\text{min}}$ holds, international investors will choose a portfolio that only contains country (asset) $A$. Unlike $\lambda_1^{\text{max}}$, the threshold value $\lambda_1^{\text{min}}$ is independent of $J$. An increasing number of

choose $\Theta^* = 1$ or $\Theta^* = 0$. We preclude any strategic behaviour of the domestic investors by assuming that they have no access to the international capital market.
internationally traded assets thus has no effect on $\lambda_{i}^{\text{min}}$. The corresponding expected return for country A in this case, $\rho + \gamma \sigma^2$, exceeds the globally expected return, $\rho$, so that investors are given an incentive to refrain from holding a broadly diversified portfolio in favor of investing all their wealth in country A.

The optimal portfolio therefore only contains all available assets if $\lambda_{i}^{\text{min}} < \lambda < \lambda_{i}^{\text{max}}$ holds. The interval that makes a portfolio that includes all countries (assets) the optimal choice narrows if the number of internationally traded assets rises and it reaches its smallest size if $J \to \infty$. The probability that investors hold a portfolio that comprises all available assets therefore falls, if J increases.

The conclusion can be drawn that an increase in the number of internationally traded assets leads to an increasing sensitivity of capital flows to changes in expected returns. Even very small differences in the expected return may provoke quite strong changes in capital flows. If one regards the increasing number of internationally traded assets as an indicator of the globalization process on international financial markets, the model implies that the integration of national financial markets into a global financial system makes drastic swings in international capital flows as a reaction to relatively weak changes of investors’ information increasingly possible. The consequences of tiny changes in market sentiment are therefore magnified in globalized markets.

3.1.3 IMPLICATIONS

Our model has three main implications. First, tiny bits of new information can lead to large swings in capital flows.36 Second, this volatility is not necessarily linked to fundamentals but may be due to shifts in market sentiment which are fully consistent with rational behaviour of the market. Third, the process of financial globalization works as a multiplier mechanism since the sensitivity of international capital flows to changes in market sentiment increases. The further financial globalization progresses, the quicker will changes in expected rates of

36 These swings in capital flows may have especially severe consequences if international capital flows are primarily intermediated through the banking sector and the banking sector is in a relatively fragile state. A crisis of the banking sector triggered by a massive withdrawal of funds leads to strong output contractions and often precipitates a currency crisis (twin crises) (see e.g. Kaminsky and Reinhart 2000).
return translate into changes in cross border flows. Thus, globalization leads to an increase in (fundamentally unnecessary) financial market volatility.

3.2 ASSET PRICE VOLATILITY AND MONETARY POLICY

3.2.1 Financial Volatility and Asset Price Volatility

The model of the previous section shows that globalization amplifies the effect of news on the portfolio allocation of global investors. Hence, the likelihood of a capital flow reversal with or without fundamental reason increases in globalized markets. The capital outflow from a country whose fundamentals are perceived to be weak is mirrored by a capital inflow into “safe havens”. Empirical research shows that this flight to quality was most prominent in the recent emerging market crises (Eichengreen, Hale and Mody 2001). The capital flows out of the countries most heavily affected by the Asian crisis – Indonesia, Korea, Thailand and the Philippines – e.g. amounted to 75 billion U.S. dollars from July 1997 until December 1998, which were mostly reinvested in Europe and the United States (Bundesbank 2000). That the flight to quality can be quite large is also implied by the increasing internationalisation of securities portfolios, which can be interpreted as an indicator of the global integration of financial markets. In Germany for example the share of foreign securities in German investment funds reached more than 50% in April 2000.

The increased volatility of international capital flows implies that asset prices will also display a higher volatility. On the basis of our model in section 3 the increase in asset price volatility must be understood as a systematic and not a transitory effect. Fluctuating asset prices, however, may have an impact on both prices and quantities. Real economic activity is influenced by soaring or declining asset prices through their impact on aggregate demand. Fluctuations in aggregate demand due to asset price movements are assumed to put upward or downward pressure on inflation. Basically, changes in asset prices are transmitted to

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37 Of course, a home bias still exists. But it has decreased in recent years. See Lewis (1999) for a comprehensive survey of the home bias literature.

38 For example, the ECB emphasizes the apparently large correlation between returns on equity markets around the world, particularly in times of declines in stock prices (see, e.g., Issing 2002). Furthermore, there appears to be a “confidence channel” as a further element of linkage, as the IMF recently emphasized (IMF 2002). That is, large country-specific shocks can transmit to the rest of the world by spreading a heightened perception of uncertainty all over the world.

39 The transmission of monetary policy through asset prices is surveyed by Mishkin (2001).
aggregate demand via three channels. First, fluctuating asset prices affect households’
consumption spending via a wealth effect. Rising asset prices thus stimulate consumption
spending, falling asset prices work in the opposite direction. Second, asset price volatility is
transmitted to the real side of the economy via the balance sheet channel. Rising asset prices
strengthen borrowers’ financial positions and reduce the external finance premium that has to
be incurred to raise funds by issuing debt or equity. If a greater share of the investment
project can be self-financed and/or more collateral can be offered to the lender, the agency
costs for which the lender must be compensated decrease because the borrower’s incentive to
engage in moral hazard behaviour is reduced. Therefore the amount of credit lenders are
willing to supply increases. Thus, volatile asset prices imply an inversely fluctuating external
finance premium, which in turn leads to volatile investment and consumption spending.
Third, asset prices affect investment spending through a cost of capital effect. If asset prices
rise, the market value of firms increases relative to the replacement cost of capital, i.e. Tobin’s
q increases. Now only a smaller number of shares or bonds have to be issued to finance a
given investment. Hence, a firm’s capital cost decreases.

The question arises whether the enhanced asset price variability should be of concern for
economic policy and, if so, how should the policymakers respond. We analyse this issue by
focusing on monetary policy and we concentrate on two distinct issues. First, we are
concerned with the questions of how the globalization-induced increase in asset price
volatility affects the conduct of monetary policy. Here we focus on inflation targeting since
this has become the dominant monetary policy strategy in the recent past. Second, we
analyse whether the (systematic) increase in asset price volatility calls for amendments to
monetary policy rules through the inclusion of asset prices to contain the potentially damaging

---

40 The external finance premium is defined as the difference in the cost of capital funded by issuing equity or
debt and by retained earnings, i.e. “... the difference in cost between funds raised externally ... and funds
generated internally...” (Bernanke and Gertler 1995, p. 28). It encompasses all costs that result from the
principal-agent-relationship between borrower and lender. These include the lender’s evaluation, monitoring and
enforcement costs, the costs due to distortions in the borrower’s behaviour arising from moral hazard or the costs
of preventing moral hazard. The external finance premium a borrower has to pay because of imperfections in
financial markets is lower the higher is his net worth, i.e. the stronger is his financial position according to his
balance sheet, and vice versa.

41 Through this channel financial markets propagate and amplify shocks to the economy so that relatively modest
impulses can result in large business cycle fluctuations. This is referred to as the “financial accelerator effect”
(Bernanke, Gertler and Gilchrist 1996, 1999).

42 Here the uncertainty-enhancing effect of globalization discussed in section 2.3 is picked up again.

43 In recent years, this strategy has been adopted not only by numerous industrial countries, but also increasingly
by emerging countries (see IMF 2002a). However, what different countries understand by or sell as “inflation
targeting” is quite different (see, e.g., Wagner 2000b, 2002b).
effects of large asset price swings. Of course, monetary policy is not the only economic policy tool to cope with the effects of asset price variability. Prudential supervision and regulation of the banking and financial system to limit risk exposure, a prudent fiscal policy and greater transparency among other things should also belong to an overall policy package directed at limiting financial instability.\textsuperscript{44} However, by setting interest rates, monetary policy has an immediate influence on asset values and thus may contain the possibly damaging effect on the rest of the economy of large asset price swings.\textsuperscript{45}

3.2.2 Asset Price Volatility and Inflation Targeting

It could be expected that a systematic increase in asset price volatility would not remain without consequences for an inflation targeting central bank. We will argue in the following that a major effect of this structural change is a reduction in the efficiency of inflation targeting. An inflation targeting central bank implements a specific operating procedure that is based on inflation forecasts as a quasi intermediate target. It uses its internal conditional inflation forecast as an intermediate target and as an indicator variable, and sets its instruments so that deviations of its conditional inflation forecast from the inflation target are erased or diminished (Svensson 1997, Bernanke et. al. 1998). Inflation targeting therefore represents a target assignment rule and not an instrument rule. It is expected to provide a nominal anchor for monetary policy and inflation expectations, to raise the transparency of the policy procedure and the accountability of the monetary authorities, and, last but not least, to solve the time inconsistency problem (see, e.g., Wagner 2000b). However, an effective and (as a precondition) credible inflation targeting framework needs to satisfy certain prerequisites (Masson, Savastano and Sharma 1997). They include a quantitative framework linking policy instruments to inflation, and the technical and institutional capacity to model and forecast inflation. Formulating a good inflation forecast is of high importance for inflation targeting central banks since inflation forecasts (as intermediate targets) provide the basis for decisions about the future monetary policy stance. However, as emphasized above, globalization is

\textsuperscript{44} See e.g. Eichengreen (1999) and Fischer (1999).

\textsuperscript{45} Alchian and Klein (1979) advanced another argument why monetary policy should be concerned with asset prices. They argue that a correct measure of inflation should measure changes in the money cost of maintaining a given utility level over time and therefore must include asset prices. Hence, a price index should include the instantaneous prices of current consumption flows as well as the current prices of future consumption. Since assets represent claims on future consumption, the current price of future consumption can be proxied by asset prices.
associated with ongoing structural changes (we stressed the systematic increase in financial volatility) that are bound to affect the ability of the central bank to accurately forecast inflation. Our model shows that in globalized markets, large swings in capital flows can be triggered by small changes in market sentiment. The resulting increase in asset price volatility forces central banks to forecast inflation in an environment of greater uncertainty. Since both the direction and the strength of monetary policy impulses depend crucially on the central bank’s assessment of future inflation, a less reliable inflation forecast enhances the danger of missing the inflation target. Against this background the conclusion can be drawn that financial globalization reduces the efficiency of inflation targeting.

Beside this conclusion which is drawn from the implications of the model presented in chapter 3, the structural changes associated with the ongoing globalization process and stressed in chapter 2 may have further effects for inflation targeters. As inflation is not controllable in the short term by monetary policy, hitting an inflation target not only requires the capacity to accurately forecast inflation but also presupposes the ability to forecast the effects of policy instruments over a one- or two-year horizon. The stability and predictability of the relationship linking monetary policy instruments to future inflation, however, may be severely impaired by the structural changes brought about by globalization. The relationship or effect of monetary policy instruments on variables affecting future inflation become more uncertain, and, in particular, the relationship between a change in today’s asset prices and future inflation becomes more unstable when financial volatility increases. These effects also contribute to a loss of efficiency of the monetary policy of inflation targeting central banks.

3.2.3 Asset Price Volatility and Monetary Policy Rules

One could further argue that financial globalization not only holds new challenges to the conduct of monetary policy for inflation targeting central banks but also requires central banks to revise their monetary policy rules. Hence, the issue discussed in the following is whether a structural increase in asset price volatility calls for a structural change in monetary policy as well. The central question is: can macroeconomic stability be improved by explicitly reacting to asset prices.

Some economists argue that monetary policy should not react actively to asset price movements. Bernanke and Gertler have forcefully formulated this position in a series of
papers (Bernanke and Gertler 1999, 2001). Bernanke and Gertler’s analysis is based on the simulation of a dynamic new-Keynesian model with credit market frictions that give rise to financial accelerator effects. They consider scenarios in which asset values are driven by non-fundamental factors, i.e. an asset price bubble develops and collapses. Market participants know the stochastic process that drives the asset price bubble but they do not know how large the bubble will become and when it will burst. In this economic environment the ability of a set of policy rules to smooth output and inflation is examined in a flexible inflation targeting framework. The key result of their simulation exercises is that a monetary policy that reacts to asset prices destabilizes the economy. In their analysis a policy rule that focuses aggressively on expected inflation only, i.e. that allows for relatively strong reactions of the nominal interest rate to variations in inflation expectations, performed best in terms of macroeconomic stability. The performance of policy rules that also respond to the asset price bubble is clearly inferior. These results imply that monetary policy should ignore asset price movements unless they signal changes in expected inflation and therefore affect the central bank’s inflation forecast. An additional response of monetary policy to asset price fluctuations is strongly rejected. Bernanke and Gertler conclude that there is no need for central banks that adopt flexible inflation targeting to react to asset price movements once the informational content of asset price fluctuations for the central bank’s inflation forecast has been controlled for. Basically, their argument runs as follows: In a regime of flexible inflation targeting, interest rates will rise if asset price booms are projected to create inflationary pressures and they will fall if declining asset values signal a weakening of inflationary tendencies. This interest rate adjustment stabilizes not only the macroeconomy but also the financial markets. Thus, macroeconomic and financial stability are simultaneously achieved.

These policy recommendations came under attack in the studies of Cecchetti et al. (2000) and Cecchetti, Genberg and Wadhwani (2002). Both use Bernanke and Gertler’s framework but introduce some modifications, e.g. by looking at optimal rules that are derived from a well specified objective function (Bernanke and Gertler determined the interest rate adjustments exogenously) or by considering a policy of interest rate smoothing. Interestingly, they reached exactly the opposite conclusion to Bernanke and Gertler. Cecchetti et al. (2000) and Cecchetti, Genberg and Wadhwani (2002) argue that central banks pursuing (flexible)

47 The term ‘flexible’ inflation targeting means that the central bank is not only concerned about price stability but also about the stability of the real economy. See Svensson (1997, 1999) for a comprehensive analysis of inflation targeting.
inflation targeting will not achieve the optimal outcome for inflation and output if they set their interest rates in response to their inflation forecast only. \(^{48}\) “… you have to work very hard to find a case in which policy should not react to asset prices in the presence of bubbles” (Cecchetti et al. 2000, p. 25). \(^{49}\) The numerical simulations of Filardo (2001) yield similar results. Filardo finds that monetary policy should respond to asset price movements as long as they provide some (however noisy they may be) information about inflation and output even if the central bank cannot tell if the asset price movements are driven by fundamental or non-fundamental (bubble) factors. This conclusion holds unless the uncertainty about the role of asset prices for the macroeconomy is quite high or the central bank’s preferences to smooth interest rates are very strong.

Cecchetti et al. (2000) and Cecchetti, Genberg and Wadhwani (2002) emphasize that monetary policy should only react to asset price misalignments, i.e. to the bubble component of asset price movements. This necessarily requires that monetary policy is able to detect bubbles, an issue many observers are sceptical about (Bernanke and Gertler 1999, Dornbusch 1999, Cogley 1999). Cecchetti et al. argue that despite all difficulties in identifying bubbles and measuring the degree of asset price misalignment, large misalignments (e.g. NASDAQ in late 1999 and early 2000) can be detected. \(^{50}\) Hence, they conclude that the interpretation of the information asset price fluctuations provide is at the heart of the dispute between them and those who deny a role for asset prices in the monetary policy function.

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\(^{48}\) Responding to Cecchetti et al.’s (2000) analysis, Bernanke and Gertler (2001) argue that Cecchetti et al.’s results differ from their own because the assumptions concerning the information the central bank possesses differ. Cecchetti et al. assume that the central bank knows for sure that asset price movements are driven by a bubble and when the bubble will burst. According to Bernanke and Gertler (2001), Cecchetti et al. would not have found it advantageous for monetary policy to actively respond to asset prices if they had relaxed these assumptions.

\(^{49}\) In Carlstrom and Fuerst’s (2001) model a policy rule that actively responds to asset price shocks is welfare-improving. Carlstrom and Fuerst point out that their result differs from Bernanke and Gertler’s because in contrast to them, Bernanke and Gertler do not compute the optimal policy rule and in their flexible price model, asset price movements do not increase or decrease inflation via their impact on aggregate demand. Hence, in Carlstrom and Fuerst’s model a central bank does not indirectly respond to asset prices by reacting to inflationary or deflationary pressures as in Bernanke and Gertler’s model.

\(^{50}\) They point out that asset price misalignments also have to be estimated if asset prices are considered for the inflation forecast. Even if the central bank does not adjust its policy instruments to asset price changes, it need to distinguish asset price movements driven by fundamental factors (e.g. productivity growth) from movements driven by a financial bubble. While the former do not necessarily exert inflationary pressure and the inflation forecast therefore may remain unchanged, the latter signal rising inflationary pressure and call for an adjustment to the inflation forecast.
Dornbusch (1999) and Issing (1999) raise theoretical objections to the inclusion of asset prices in the monetary policy function. They argue that such a policy would jeopardize the central bank’s credibility and even its independence because asset price movements are asymmetrically interpreted. While booms are seen as good and rising interest rates will then be disapproved of by the public, injecting liquidity when asset prices fall is generally wanted. But an asymmetry in reacting to rises and falls in asset prices creates a moral hazard problem. If market participants perceive or assume that the central bank reacts to busts by cutting interest rates but is unwilling to be restrictive in times of a boom, they will ex-ante engage in overly risky investments. The resulting excessive risk accumulation itself then contributes to the emergence of bubbles and endangers the stability of the financial sector.51

So far the literature gives no clear-cut answer to the question of how monetary policy should respond to asset price fluctuations. There is a broad consensus among economists that asset price fluctuations can strongly affect the real economy. But there is, at least at present, no consensus about whether policymakers should respond actively to asset price movements. Both conflicting views on the role of asset prices for monetary policy that we discussed above agree that asset price movements ought to be taken into account when inflation targeting central banks formulate their inflation forecast. However, they disagree strongly about whether this is a sufficient consideration of asset prices for monetary policy. Against this background one cannot make any final statement about whether an appropriate reaction of monetary policy to the increased asset price volatility consists of adopting a policy rule that includes asset prices. One can, however, conclude that the formulation of the central banks’ inflation forecasts will become more challenging and be subject to growing uncertainty since asset price volatility increases in globalized markets. Since the inflation forecast serves as the intermediate target for an inflation targeting central bank, it can be argued that financial globalization contributes to a loss of efficiency in central bank monetary policy.

4 CONCLUSION

This paper has analysed the effect of financial globalization on inflation on the one hand and on financial market volatility on the other and discussed the implications for monetary policy. It argues that even if globalization, by increasing the locational competition for mobile capital

51 See also Illing (2001).
among regions and countries, suppresses inflation pressures and hence decreases inflation, this would not mean that the task of monetary policy for central banks becomes easier and that therefore central banks should shift their priorities from fighting price stability towards fighting economic recessions. There are some pitfalls with respect to such a policy conclusion. In particular, ongoing globalisation is associated with ongoing structural changes. This increases uncertainty about the macroeconomic indicators and data and the transmission mechanism of monetary policy, and increases model uncertainty. One uncertainty-enhancing phenomenon and consequence of these structural changes is the rise in financial volatility.

Volatility of financial markets has been identified as a key problem of globalisation (see e.g. Masson 2001). Capital flows (to emerging markets in particular) have been very volatile in the recent past. Moreover, the volatility of international capital flows to the emerging markets is not always matched by a corresponding volatility of fundamentals in the recipient countries. We offered an explanation for these observations. Our model explains the volatility of international capital flows as the result of rational agents’ optimal portfolio allocation. Rational forecast errors that investors make while processing new information can give rise to financial volatility unrelated to fundamentals. It is shown that the problem of financial volatility is exacerbated as the globalization of financial markets progresses because deviations from the global mean in expected return of assets are less tolerated. Forecast errors can thus produce larger swings in capital flows without fundamental reasons.

An increase in international capital flow volatility implies a widespread increase in asset price volatility on international capital markets as well. Against this background we analysed the monetary policy consequences and challenges of this globalization-induced structural change on international financial markets. The appropriate reaction of monetary policy to asset price fluctuations is currently the subject of much debate. The controversy circles around the question of whether asset price movements are interesting only insofar as they provide information for the central bank’s inflation forecast, or whether macroeconomic performance, given expected inflation, can be improved by including asset prices in central banks’ reaction functions. Two opposing positions with regard to this issue prevail in the literature. Some economists argue that central banks should not respond to asset price fluctuations over and above their consideration in the inflation forecast. This view is rejected by other economists who find that the inclusion of asset prices in the central bank’s monetary policy rule enhances welfare. Further theoretical and empirical research on both views is needed before a
consensus on the appropriate reaction of monetary policy to asset price fluctuations can be reached. Hence, whether central banks should alter their policy rule and attempt to contain the potentially damaging effects of an increase in asset price variability remains open to debate. It can be concluded, however, that with increasing globalization of financial markets, the conduct of monetary policy will become more challenging for inflation targeting central banks (but not only for them) since uncertainty about the inflation outlook will increase. The inflation forecast as the intermediate target will, therefore, have to be formulated in an environment of greater uncertainty so that the efficiency of inflation targeting might be impaired.
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Appendix (on chapter 2.2)\textsuperscript{52}

The basic model

We formulate a mainstream Barro and Gordon (1983)-type model of macroeconomic policy and inflation. Policy is assumed to minimize the following quadratic loss function:

\[ E[L(p, y)] = L = E\{0, 5[(\pi - \pi^*)^2 + b(y - y^*)^2]\} \]  \hspace{1cm} (1)

where \( \pi \) and \( y \) denote inflation and employment (or output growth) respectively, \( \pi^* \) and \( y^* \) are society’s most preferred values for inflation and employment (or output growth), and \( b \) is the relative weight on fluctuations in these two variables.

The loss function is minimized under the constraint of an expectations-augmented short-run Phillips curve

\[ y = y_n + c(\pi - \pi^o) - \varepsilon \]  \hspace{1cm} (2)

where \( \varepsilon \) is a supply shock (with mean 0 and variance \( \sigma^2 \)) and \( y_n \) can be interpreted as the natural rate of employment (or output growth). It is assumed that \( y_n < y^* \) and (at first) that \( c = 1 \).

Furthermore we add the demand side of our model being represented by

\[ \pi = m + v \]  \hspace{1cm} (3)

where \( m \) is the growth rate of money and \( v \) is a velocity shock (with mean 0 and variance \( \sigma^2 \)). In addition, we assume rational expectations information so that

\[ \pi^e = E(\pi \mid y_n) = E(m \mid y_n) \]  \hspace{1cm} (4)

where \( E \) is the mathematical expectations operator.

Then, as is widely accepted in the literature, we can derive an inflation bias of \( b(y^* - y_n) \) from the difference between the optimal rate of inflation,

\[ \pi_O = \pi^* + \left[ b/(1+b) \right] \varepsilon \]  \hspace{1cm} (5)

\textsuperscript{52} This appendix is taken, to a large extent, from Wagner (2002a).
and the discretionary rate of inflation

\[ \pi_D = \pi^* + b(y^* - y_n) + [b/(1+b)] \varepsilon. \]  

(6)

**Effect of real integration on inflation: Romer case**

Since globalization goes hand in hand with more open economies, the surprise inflation effect, which induces a lower increase in output, can be interpreted as one effect of globalization that is relevant for monetary policy. In the above model context, this effect would mean that the Phillips curve is steeper \((d\pi/dy = 1/c \text{ increases})\). This would reduce the inflation bias:

\[ \pi_D^{\text{Romer}} = \pi^* + cb(y^* - y_n) + [cb/(1+c^2b)] \varepsilon, \text{ where } 0 < c < 1. \]  

(7)

**Effect of financial integration: Increase in the costs of a delay of reforms**

In this section, inflation is considered to be the result of inefficient structural conditions. We consider an economy in which the socially desired level of output can only be reached when government implements reforms \(r^*\). The de facto implemented reforms \(r\) may fall short of \(r^*\) because reforms are costly for the government. We denote this positive difference \(r^*-r > 0\) as backlog or delay of reform. We suppose that a backlog or delay of reform implies higher unemployment and lower production (see Calmfors 1998).

The supply function is

\[ y = y^* + c(\pi - \pi^e) - a(r^*-r) - \varepsilon, \]  

(8)

where \((r^*-r) = \text{“delay of reform”}\), and \(y^* - a(r^*-r) = y_n.\)

---

53 The corresponding output is \(y = y_n - [1/(1+c^2b)] \varepsilon.\)

54 The model in this section differs from the Romer model insofar as the Romer model assumes that the policymaker chooses a rate of inflation (or money growth) under the assumption that inflation expectations are unaffected by this decision, whereas here, policymakers choose the rate of inflation under the assumption that they can affect inflation expectations.
In this case, for reasons of simplicity, we set $c=1$ and $\varepsilon = 0$ and normalize $y^*$ to 0. Based on the arguments above, we assume that globalization, through an increase in locational competition and in capital mobility, in time leads to an increase in production losses caused by a given delay of reform. That is, this aspect of globalization is denoted, in a comparative-static sense, by $da > 0$ (a once-for-all increase in $a$).\footnote{This may be regarded as a weakness of the model as in the text we interpret globalization as a dynamic process. Nonetheless, the model can serve as a starting point and be supplemented by dynamic aspects (see the Conclusion below).}

Economic policy is conducted by two policy actors, the government and the central bank. The government, on the one hand, fixes the level of reforms ($r$). It minimizes the following loss function:

$$L^{Gov} = 0.5((\pi - \pi^*)^2 + b(y - y^*)^2 + zr^2), \text{ where } y^* = \pi^* = 0, \ b, \ z > 0$$ (9)

We assume that the implementation of reforms is associated with political costs ($z > 0$) for the government.

The central bank, on the other hand, decides about the rate of inflation by minimizing the loss function $L^{CB}$.

$$L^{CB} = 0.5((\pi - \pi^*)^2 + b_{CB}(y - y^*)^2), \text{ where } y^* = \pi^* = 0, \ b \geq b_{CB} > 0$$ (10)

This loss function does not include $r$ since we assume that the central bank is “independent” and not responsible for the implementation of the reforms.\footnote{This assumption is not of significance for the result here.} In addition, in analogy to Rogoff (1985), we assume that the central bank might not weigh output stability as highly as the government does ($b_{CB} \leq b$). Furthermore, to simplify calculations, we assume in the following that the target levels for inflation and output (in logarithm) are zero ($y^* = \pi^* = 0$).

The macroeconomic outcomes depend upon whether the economic policymakers are committed or act in a discretionary way vis-a-vis the public. Furthermore, when monetary policy is discretionary, we have to distinguish between Nash- and Stackelberg equilibria.
**Monetary policy rule**

In the case of monetary policy commitment, we do not have to differentiate between whether the reform by the government follows a rule or is discretionary.

With committed monetary policy, on the basis of the model structure above, we get the following solutions:

\[
 r_R = \frac{a^2b}{z + a^2b} \rho^*; \quad 0 < \rho^* < \rho^* \\
\pi_R = 0 = \pi^* \\
y_R = \frac{-az}{z + a^2b} \rho^*; \quad y_R < 0 = y^* 
\]

From equation (11) we see that a delay of reforms is optimal for the government if there are political costs of the implementation of reforms \((z > 0)\). This delay of reforms implies that output lies below its desired level (see equation (13)). From equation (11) we also see that the aspect of globalization considered here (expressed by \(da > 0\)) induces reforms.\(^{57}\) Nevertheless, it leads to a loss in output if \(z > a^2b\).\(^{58}\)

**Discretionary monetary policy and committed reform\(^{59}\)**

We assume the following timing of events:

(i) First, the government chooses a policy rule \(r\).

(ii) The private actors form inflation expectations.

(iii) Government implements the reforms that were chosen at step 1.

(iv) Finally, the central bank chooses the rate of inflation.

This game structure supposes that the government is credible to the private actors and actually implements the plan for reforms chosen in step (i). The government considers that its choice

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\(^{57}\) This can be seen from the derivation \(dr_R/da\) in equation (11).

\(^{58}\) This can be seen from the derivation \(dy_R/da\) in equation (13).

\(^{59}\) The case of “discretionary monetary policy and discretionary reform”, in which we have to distinguish between a Nash-equilibrium and a Stackelberg-equilibrium with leadership of the government, is not analyzed here. The result would not be fundamentally different (Kißmer 2001). It can be shown however that the above threshold declines when reform is not credible.
of reform has influence on the inflation expectations and the rate of inflation chosen by the central bank. The government thus behaves like a Stackelberg leader vis-a-vis the public and the central bank.

From the first order condition of the central bank’s optimization problem, we get

\[ \pi = \pi^e = a \, b \, CB \,(r^* - r) \]  

(14, 15)

We see that the private actors only expect inflation just when there is a delay of reform. The reason is that the central bank has a too ambitious output target \( y^* = 0 > y_n = -a(r^* - r) \). Hence, in the case of a delay of reform and discretionary monetary policy, the central bank has an incentive to raise the output by creating a surprise inflation.

However, the extent of reforms is not exogenously given but is determined by the government. By inserting (14, 15) into the loss function of the government, we can calculate inflation and output, after determining the optimal level of reforms. The solutions of the Stackelberg equilibrium (SR) with committed reform are

\[ r_{SR} = \frac{a^2 (b + b_{CB}^2)}{z + a^2 (b + b_{CB}^2)} \, r^* ; \ 0 < r_R < r_{SR} < r^* \]  

(16)

\[ \pi_{SR} = \frac{ab_{CB}^2}{z + a^2 (b + b_{CB}^2)} \, r^* ; \ \pi_{SR} > 0 = \pi_R \]  

(17)

\[ y_{SR} = \frac{-az}{z + a^2 (b + b_{CB}^2)} \, r^* ; \ y_R < y_{SR} < 0 \]  

(18)

From equation (16) it follows that, with discretionary monetary policy, a delay in reform is optimal \( r_{SR} < r^* \), if there are political costs of an implementation of reforms \( z > 0 \). However, the extent of the delay of reform is smaller compared with the case of a committed monetary policy; hence the output is higher.

From equation (17) we see that, with discretionary monetary policy, a delay of reform leads to higher inflation \( \pi_{SR} - \pi_R > 0 \).\(^{60}\)

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\(^{60}\) When there is a delay of reform (which exists when \( z > 0 \), see equation (16)), the output level remains below the desired level. Therefore, there is an incentive for the discretionary monetary policy to increase the output by producing a surprise inflation. Since this is anticipated by the private actors and the government, the monetary policy contains an inflation bias.
Which effect does this aspect of globalization have here? The results show that, as in the case of a committed monetary policy, globalization leads to an increase in reforms. Whether it leads to so-called “New Economy effects” \( \frac{d\pi}{da} \leq 0 < \frac{dy}{da} \), depends upon the extent of the reforms implemented, or, in other words, upon the degree of reform aversion \( z \).

If \( z < a^2(b + b_{CB}^2) \), globalization creates New Economy effects, i.e. raises production and lowers inflation. If, \( z > a^2(b + b_{CB}^2) \), however, globalization (in the above sense) leads to lower production and higher inflation.

**Conclusion**

In this comparative-static model variant, we have shown that globalization (denoted by its effect of an increase in the costs of a delay of reforms, i.e. of \( da > 0 \)) decreases inflation if \( z < a^2x \), where \( x = b + b_{CB}^2 \) in the above case. However, if \( z > a^2x \), globalization can create undesired macroeconomic effects, i.e. it can increase inflation and decrease output. Above, however, we have introduced globalization as a dynamic process. Therefore, one may be inclined to assume that globalization gradually increases the output costs of a delay of reforms (i.e., \( a \))\(^{61}\), so that eventually (apart from extreme cases\(^{62}\), where \( z \to \infty \)) the condition \( z < a^2x \) will be effective and inflation will decline. This, however, can not be derived from the above model because in every case, when \( a \) increases, the extent of the backlog or delay of reforms \( (r^*-r) \) declines. However, what can reasonably be assumed, is that over time the general understanding of the necessity of reforms increases so that the political costs of reforms \( (z) \) decrease. This eventually would have the consequence that the condition \( z < a^2x \) will be effective and inflation will decrease. Alternatively one can also think of other changes in the loss functions of the government, of the society or of the central bank.

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\(^{61}\) The stronger the global economic integration is, the stronger will be the pressure of competition, and the greater will then be the output loss of a delay of reforms (expressed by high inflation), i.e. the larger will be \( a \).

\(^{62}\) The reform unwillingness in a country can be derived from country-specific coordination problems with respect to the means of reform and to the corresponding distribution of the reform costs. It thus is the result of specific social conditions; see e.g. Drazen (2000).
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<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>75/2002</td>
<td>A Theory of the Currency Denomination of International Trade</td>
<td><em>P. Bacchetta and E. van Wincoop</em></td>
</tr>
<tr>
<td>76/2002</td>
<td>Commodity Currencies and Empirical Exchange Rate Puzzles</td>
<td><em>Y. Chen and K. Rogoff</em></td>
</tr>
<tr>
<td>77/2002</td>
<td>Exchange Rate Pass-Through, Exchange Rate Volatility, and Exchange Rate Disconnect</td>
<td><em>M.B. Devereux and Ch. Engel</em></td>
</tr>
<tr>
<td>78/2002</td>
<td>Exchange Rates and Fundamentals a Non-Linear Relationship?</td>
<td><em>P. de Grauwe and I. Vansteenkiste</em></td>
</tr>
<tr>
<td>79/2002</td>
<td>How has the Euro Changed the Foreign Exchange Market?</td>
<td><em>H. Hau, W. Killeen and M. Moore</em></td>
</tr>
<tr>
<td>80/2002</td>
<td>External Wealth, the Trade Balance, and the Real Exchange Rate</td>
<td><em>Ph.R. Lane and G.M. Milesi-Ferretti</em></td>
</tr>
<tr>
<td>81/2002</td>
<td>PPP and the Balassa Samuelson Effect: The Role of the Distribution Sector</td>
<td><em>R. MacDonald and L. Ricci</em></td>
</tr>
<tr>
<td>82/2002</td>
<td>On the Strength of the US Dollar: Can it be Explained by Output Growth?</td>
<td><em>P.J.G. Vlaar</em></td>
</tr>
<tr>
<td>83/2002</td>
<td>Comovement in International Equity Markets: a Sectoral View</td>
<td><em>R.P. Berben and W.J. Jansen</em></td>
</tr>
<tr>
<td>84/2002</td>
<td>The Welfare Cost of Structural Distortions and Stochastic Shocks</td>
<td><em>P.A.D. Cavelaars</em></td>
</tr>
<tr>
<td>85/2002</td>
<td>Double Discretion, International Spillovers and the Welfare Implications of Monetary Unification</td>
<td><em>P.A.D. Cavelaars</em></td>
</tr>
<tr>
<td>86/2002</td>
<td>Cyclical Patterns in Profits, Provisioning and Lending of Banks</td>
<td><em>J.A. Bikker and H. Hu</em></td>
</tr>
</tbody>
</table>
No. 87/2002  Efficiency and Cost Differences Across Countries in a Unified European Banking Market
  J.A. Bikker

No. 88/2002  Aiming for the Bull’s Eye: Inflation Targeting under Uncertainty
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  Tamim Bayoumi and Hali Edison