Bannier, Christina E.

Working Paper

Big elephants in small ponds: Do large traders make financial markets more aggressive?

Volkswirtschaftliche Diskussionsbeiträge, No. 77

Provided in Cooperation with:
Fachbereich Wirtschaftswissenschaften, Universität Kassel

Suggested Citation: Bannier, Christina E. (2004) : Big elephants in small ponds: Do large traders make financial markets more aggressive?, Volkswirtschaftliche Diskussionsbeiträge, No. 77, Universität Kassel, Fachbereich Wirtschaftswissenschaften, Kassel

This Version is available at:
https://hdl.handle.net/10419/32146

UNIKassel
VERSITÄT

Institut für
Volkswirtschaftslehre

Big Elephants in Small Ponds: Do Large Traders Make Financial Markets More Aggressive?

von

Christina E. Bannier

Nr. 77/05

Volkswirtschaftliche Diskussionsbeiträge

Big Elephants in Small Ponds: Do Large Traders Make Financial Markets More Aggressive?*

Christina E. Bannier†

3rd November 2004

Abstract

Market participants often suspect that large traders have a disproportionate effect on financial markets, increasing the aggressiveness of market responses. Prior studies have shown that the impact of a large trader on a currency crisis depends positively on his "size" and informational position. By contrast, this article highlights the role that market sentiment has on the impact of a large trader. If the market believes that fundamentals are weak, then the probability of a crisis depends positively on the trader's size but negatively on the precision of his information, with these effects reversed in a generally optimistic market. A large player, therefore, need not make market responses more aggressive.

JEL-Classification F31, D82
Keywords: currency crises, large traders, market sentiment, coordination, private and public information

*The author wishes to thank Robert King, the editor, and an anonymous referee for guidance and very constructive comments. The paper also benefited from comments and advice from Peter Anker, Giancarlo Corsetti, Martin Hellwig, Jörg Lingens and Jochen Michaelis.

†Christina E. Bannier, Department of Finance, Goethe-University Frankfurt, Mertonstrasse 17-21, 60325 Frankfurt, Germany, E-mail: bannier@finance.uni-frankfurt.de, Phone: +49 69 798 23386, Fax: +49 69 798 28951

1 Introduction

During the last years, the activities of large traders in financial markets such as hedge funds, major commercial banks and other highly leveraged institutions (HLIs) have strongly increased. Many analysts and policy makers have expressed their concerns that large players may have a disproportionate effect on the markets and as such may trigger or exacerbate crises that are not fully justified by fundamentals, hence destabilizing the international financial system.

Following prominent examples of large traders' actions on foreign exchange markets and their aftermaths (for instance the bitter fight between George Soros and Dr. Mahathir, prime minister of Malaysia, in 1998), the Financial Stability Forum (FSF) established a study group to assess the 1998 market turmoil and the role of HLIs. Although the group found only controversial evidence of destabilizing effects on the part of HLIs, its report in 2000 made clear that large traders played a material role during several currency crisis episodes, among them the ERM crisis in 1992-93, the 1994-95 Mexican peso crisis, the attack on the Thai baht in 1997 and the Malaysian ringgit in 1997-98. Additionally, the report highlighted the role played by large traders' informational positions, remarking on examples of rumors spread by HLIs in order to weaken currencies (FSF, 2000).

Even in the absence of a crisis, large traders have gained importance on financial markets during the past few years. In the United States, major foreign exchange market participants are required by law to give regular reports on their holdings of foreign currency. These Treasury Foreign Currency reports show that although the number of large traders (an institution qualifies as "large" according to a definition by the Treasury, if it has the equivalent of more than $50 billion in foreign exchange contracts on its books) has declined, the net dealing positions of large traders have increased over time.

Regarding the often mentioned concern that large traders act as "big elephants in small ponds" however, most of the empirical studies on the influence of HLIs in currency crisis events come to a rather modest result: rather than exerting an effect that runs contrary to the development of fundamentals and thereby forcing a devaluation of the fixed parities, large traders have most often been found to behave in accordance with fundamentals, attacking only those currencies that already displayed a fundamental tendency to devalue (IMF, 1998; Corsetti, Pesenti and Roubini, 2002).

Against this background, theoretical analyses started to examine the role of large speculators in financial crises, notably in currency crises, in more detail. These studies investigated in particular the influence of a large trader's size, i.e. his financial "market power", and his informational position. In a global games setting, these aspects have been analyzed extensively by Corsetti, Dasgupta, Morris and Shin (hereafter CDMS, 2004) and Corsetti, Pesenti and Roubini (hereafter CPR, 2002).[1] Enriching earlier work on currency crisis models with incomplete information (Morris and Shin, 1998) by a het-

[1] CPR (2002) reconsider the theoretical results of CDMS (2004). Additionally, they present empirical evidence from recent crisis episodes and give a critical account of the policy debate on the role of large traders in currency crises.

erogeneous structure of traders, these studies found that a large trader's market impact strongly depends on his size. Whenever the large player has sufficient financial market power, the danger of a crisis increases as compared to the case where only small speculators trade on the market. In this respect, the presence of a (sufficiently) large trader always makes small market participants more aggressive. Additionally, an improvement in the large speculator's information accuracy is shown to unambiguously increase the incidence of a currency attack.[2]

Despite their insightful results, the studies by CDMS (2004) and CPR (2002) display one major shortcoming. Even though the equilibrium can be shown to be unique, it is not possible to derive closed-form solutions of the equilibrium values. Comparative static analyses are therefore conducted only for the limiting case of very precise information held by large and small traders.

Regarding the formal modeling of players' behavior in the work by CDMS (2004) and CPR (2002) two more comments are in order. First, the authors assume a slight asymmetry in the behavior of small and large speculators. Whereas small traders are assumed to take the behavior of the large agent directly into account by trying to anticipate his optimal action, the large trader only indirectly considers the behavior of the rest of the market. In particular, he does not attempt to assess small traders' information in order to anticipate their actions. Since there is no aggregate uncertainty on the part of small speculators for given economic states, however, the mass of small traders can move a large fraction of the market. Neglecting this effect when deciding on his optimal action does not appear reasonable for a large player. Second, the earlier models assume that the central bank is bound to react to observed trading behavior on the foreign exchange market instead of being entitled to more active, anticipatory actions.

In contrast to these former studies, we analyze the impact of a large player on a fixed exchange rate parity in a model that is based on a symmetric strategy of both small and large traders (therefore denoted as "symmetric approach") and allows for preemptive action by the central bank. Due to the slightly changed time structure, closed-form solutions for the equilibrium values can be derived. In contrast to CDMS (2004) and CPR (2002), we find that the large trader's impact is strongly contingent on the market sentiment.[3] Large players therefore do not always act like "big elephants in small ponds." Rather, the incidence of a speculative attack will only be increased by the large trader if the market believes that economic fundamentals are sufficiently weak.[4] In an optimistic market, in contrast, the presence of a large trader will generally re-

[2]CDMS (2004) and CPR (2002) also consider potential signaling effects of a large player's trading position in a dynamic setting. They find that his influence on the rest of the market is greatly magnified if his action is revealed to small traders prior to their trading decisions.

[3]The earlier studies do not allow for a role of the market sentiment due to the assumed improper prior distribution of economic fundamentals. Changing the assumption about the prior distribution, a similar analysis could be carried out. It would, however, succumb to technical difficulties because of the non-existence of a closed-form solution for the equilibrium values.

[4]In a setting with multiple equilibria CPR (2002) come to a similar result. They show that a large trader increases the range of beliefs over economic fundamentals that trigger an attack by coordinating small traders' behavior on the crisis equilibrium in an interval of low market sentiments.

duce the danger of a crisis. Likewise, the impact of the large player's informational position depends on the market sentiment. Greater accuracy of his private information increases the probability of a currency crisis only if fundamentals are generally believed to be strong. For a pessimistic market sentiment, the effect is reversed. However, this "information effect" decreases along with the large trader's market power.

Section 2 briefly restates the basic model and the main results of the "asymmetric approach" by CDMS (2004) and CPR (2002). In contrast to their original work, however, we use a setting of normal distributions in order to facilitate comparisons with the "symmetric approach" presented in section 3. After deriving the equilibrium values in section 3.1, we analyze the impact of the large trader's size and his informational position on the probability of a currency crisis and the dependence on the prevailing market sentiment in section 3.2. Section 4 summarizes the results and concludes.

2 A Review of the Asymmetric Approach

2.1 Basic Model

The studies by CDMS (2004) and CPR (2002) consider an economy where the exchange rate is pegged to a fixed level by the central bank. The market consists of a single large trader with a trading limit of $\lambda < 1$ and a continuum of small speculators with a combined trading limit of $1 - \lambda$. Short selling is associated with cost t. If an attack on the currency peg is successful, each attacking trader receives a fixed payoff of D, $D \gg t$.[5] Traders not attacking the currency receive a net-payoff equal to zero.

It is assumed that the central bank successfully defends the peg as long as the mass of attacking speculators, l, is low relative to the fundamental state of the economy, θ.[6] However, the central bank has to abandon the peg if $l \geq \theta$. Consequently, if fundamentals are sufficiently strong ($\theta > 1$), the fixed parity is maintained, irrespective of the actions of the traders. If θ is sufficiently low ($\theta \leq 0$), the currency peg will fail. Intermediate fundamental values, $0 < \theta \leq 1$, allow for both a speculative attack as well as financial stability.[7] Note that in this interval currency crises are inefficient, since abandoning the peg could have been prevented if the number of attacking speculators had been sufficiently low.

The game between central bank and speculators has the following stages: first, nature selects the fundamental state $\theta \sim N(y, \frac{1}{\alpha})$. The central bank observes the true fundamental state, whereas speculators only get to know its distribution. Since the distribution of θ is assumed to be common knowledge, we refer to α as the precision of public information. The prior mean y can be interpreted as the "market sentiment," i.e.

[5] Payoff and cost parameters are given per unit of domestic currency.

[6] This captures the assumption that the central bank derives a positive utility from maintaining the parity but bears a cost from defending the peg, which decreases with strengthening fundamentals θ but increases in the speculative mass l attacking peg.

[7] Typical second-generation currency crisis models assume θ to be common knowledge, so that multiple equilibria are obtained for $\theta \in (0, 1]$. See also Metz (2003) for an overview on this issue.

the fundamental state that is commonly expected by the market. In addition to public information, small speculators receive independent private signals $x_i|\theta \sim N(\theta, \frac{1}{\beta})$, while the large trader observes a private signal $x_l|\theta \sim N(\theta, \frac{1}{\gamma})$ that is independent of the x_i. Even though the distribution of private signals is assumed to be common knowledge, as long as precision values β and γ are bounded from infinity, speculators can neither precisely establish the true value of θ nor the private information of their opponents. Contingent on public and private information, speculators simultaneously and independently have to decide whether or not to attack the fixed parity in the second step. The central bank finally observes the proportion of attacking speculators, l, and abandons the peg whenever $l \geq \theta$.

As has been demonstrated by CDMS (2004), the model entails a unique equilibrium in trigger strategies as long as private information is sufficiently precise relative to public. In equilibrium, small speculators follow a trigger strategy around x^*, i.e. each small speculator attacks the currency peg if his private signal is lower than or equal to x^*. Let θ_1^* be the value of the fundamental index at which the central bank is indifferent between abandoning and keeping the peg if only small speculators attack the currency. It is defined by

$$\theta_1^* = (1-\lambda)\Phi(\sqrt{\beta}(x^* - \theta_1^*)) \;, \tag{1}$$

since a crisis occurs if l is at least as large as θ.[8] If there were no large speculator in the market, the central bank would be forced to abandon the peg for all states below θ_1^* due to the speculative pressure exerted by small traders and would keep the peg otherwise. If, however, the large trader decides to join the attack, the speculative pressure rises by λ. The critical value of the fundamental state up to which an attack is successful if the large speculator joins the attack, θ_2^*, is defined by

$$\theta_2^* = \lambda + (1-\lambda)\Phi(\sqrt{\beta}(x^* - \theta_2^*)) \;. \tag{2}$$

The large trader will be indifferent between attacking and not attacking the fixed parity, based on his information, if

$$\begin{aligned} D \cdot \text{prob}(\theta \leq \theta_2^* | x_l) &= t \\ D \cdot \Phi(\sqrt{\alpha+\gamma}(\theta_2^* - \frac{\alpha}{\alpha+\gamma}y - \frac{\gamma}{\alpha+\gamma}x_l^*)) &= t \;. \end{aligned} \tag{3}$$

This indifference condition delivers a unique threshold value x_l^*, such that the large trader will attack the peg whenever his private signal is below or equal to x_l^*, but will refrain from doing so for $x_l > x_l^*$.[9]

The small traders' threshold signal x^* is defined by a similar condition of indifference. However, according to CDMS (2004), their probability of a successful attack does not only depend on the realized fundamental index, but also on the incidence of the large

[8] $\Phi(\cdot)$ represents the cumulative density function of the standard normal distribution, $\phi(\cdot)$ the non-cumulative density function.

[9] Note that the large trader's strategy is not directly influenced by x^*, the trigger value for the small traders' optimal actions, but depends on the threshold fundamental state θ_2^*.

trader joining the attack or not, so that indifference is given for

$$D \cdot \text{prob}(\theta \leq \theta_1^* | x^*) + D \cdot \text{prob}(\theta_1^* < \theta \leq \theta_2^* | x^*) \cdot \text{prob}(x_l \leq x_l^* | \theta) \quad = \quad t \, . \tag{4}$$

This condition can be transformed to

$$\begin{aligned} & D \cdot \Phi\Big(\sqrt{\alpha+\beta}(\theta_1^* - \frac{\alpha}{\alpha+\beta}y - \frac{\beta}{\alpha+\beta}x^*)\Big) + \\ D \cdot \left(\int_{\theta_1^*}^{\theta_2^*} \phi\Big(\sqrt{\alpha+\beta}(\theta - \frac{\alpha}{\alpha+\beta}y - \frac{\beta}{\alpha+\beta}x^*)\Big)\Phi\Big(\sqrt{\gamma}(x_l^* - \theta)\Big)d\theta\right) & \quad = \quad t \, . \end{aligned} \tag{5}$$

Note that the small speculators explicitly take the large trader's action into account, i.e. x_l^* enters indifference condition (5) directly, whereas the large agent's action is not explicitly contingent on the small traders' choices, so that speculators' behavior is modeled asymmetrically.

As it is not possible to derive closed-form solutions for the equilibrium values $(x^*, x_l^*, \theta_1^*, \theta_2^*)$ in this model, the conduct of comparative statics becomes slightly cumbersome. In order to facilitate the analysis, CDMS (2004) and CPR (2002) explore the parameters' impact in the limit, where both types of traders have very precise private information, i.e. for $\beta \to \infty$, $\gamma \to \infty$, and $\frac{\gamma}{\beta} \to r$, with r being constant.

2.2 Influence of the Large Trader

For the limiting case with completely precise private signals, the threshold values x^* and x_l^* must converge to the value of the fundamental index at which the peg switches from being abandoned to being kept. Since in the limit the large speculator always attacks the fixed parity at states worse than θ_2^*, but refrains from attacking for better states, it holds that $x^* = x_l^* = \theta_2^*$. A devaluation therefore occurs with certainty for all fundamental states lower than θ_2^*.

The question whether the large trader has an influence on the probability of a currency crisis hence simplifies to the issue of whether θ_2^* is higher or lower than the threshold value of the game with only small speculators, θ_1^*. For $\beta \to \infty$, it follows from (1) that in the case with only small speculators $\theta_1^* = 1 - \lambda$. Thus, whenever θ_2^* turns out to be higher than $1 - \lambda$ for completely precise private signals of both large and small traders, the presence of the large agent has a positive influence on the probability of a currency crisis. From (2), it is moreover evident that θ_2^* increases in the large trader's size, λ. Hence, the following propositions hold:

Proposition 1 (CDMS, 2004) *In the limit as noise vanishes, so that $\beta \to \infty$, $\gamma \to \infty$, and $\frac{\gamma}{\beta} \to r$, the large trader increases the ex ante probability of a currency crisis whenever $\lambda > 1 - \theta_2^*$. Moreover, in this case, the probability of a crisis as approximated by the length of the interval $[0, \theta_2^*]$ increases in λ.*

Proposition 2 *In the limit with vanishing noise, the large trader makes small speculators more aggressive whenever he is sufficiently large, i.e. for $\lambda > 1 - \theta_2^*$.*

With completely precise private signals, the threshold values for private signals are equal to the fundamental threshold value: $x^* = x_l^* = \theta_2^*$. Hence, if θ_2^* increases in the case of $\lambda > 1 - \theta_2^*$, then x^* must rise as well, so that if accompanied by the large trader, small speculators will attack the fixed parity for higher signal values than before.

In order to at least indirectly derive a result for the large trader's informational position, CPR (2002) assume his private information to be arbitrarily more precise than that of the rest of the market, i.e. $r \to \infty$. If the large trader's information is completely precise and small speculators know this, they will attach a probability of one to the incidence of an attack by the large speculator for all fundamental states lower than θ_2^* and zero otherwise. The subsequent proposition then follows quite obviously:

Proposition 3 (CPR, 2002) *In the limit as noise vanishes while the large trader's private information becomes arbitrarily more precise than the small traders' information, so that* $\beta \to \infty$, $\gamma \to \infty$, *and* $\frac{\gamma}{\beta} \to \infty$, *the large trader makes the small speculators more aggressive and raises the ex ante probability of a currency crisis.*

The asymmetric approach by CDMS (2004) and CPR (2002) shows that whenever all speculators possess very precise information, the large trader renders the market more aggressive and thereby increases the danger of a crisis, provided he has sufficient financial power as stated by propositions 1 and 2. In this case, his size outweighs the lacking dominance of superior information so that he coordinates small traders' behavior simply by his ability to move a large fraction of the market. Whenever the large trader possesses superior information, however, the small speculators follow his actions irrespective of his market power. In the latter case, the large trader always increases the probability of a crisis.[10]

These insightful issues notwithstanding, the results by CDMS (2004) and CPR (2002) are derived under restrictive assumptions regarding the private information of market participants. As the asymmetric modeling of speculators' behavior does not allow a general derivation of closed-form solutions for equilibrium values, the displayed results are valid only for the special case of extremely precise private information, but do not hold in general. The following section therefore considers a modified approach, where traders' optimal behavior is assumed to follow symmetrical structures. This model allows the derivation of general results for the role of large speculators in financial crises.

3 The Symmetric Approach

The model in this section distinguishes itself from the approach by CDMS (2004) and CPR (2002) in two respects. First, we assume that both small traders and large trader employ symmetric strategies. Second, we use a slightly changed time structure. Whereas in the former model it has been assumed that the central bank can only react to observed trading positions on the foreign exchange market, in this section we suppose that she

[10] For an analysis of the parameters' influence away from the limit see CDMS (2004).

may engage in preemptive action, based on her anticipation of traders' behavior.[11] Therefore, she will base her decision on the expected value of l and will abandon the peg whenever $E(l|\theta) \geq \theta$. As we will see, this assumption helps to smooth the indifference condition for the central bank, so that the model entails a continuous speculative mass condition and delivers closed-form solutions.

The structure of the model in this section is as follows: first, nature selects the fundamental state $\theta \sim N(y, \frac{1}{\alpha})$. The central bank observes the realized fundamental state, whereas speculators do not. The distribution of θ is public information. Second, small speculators receive their private signals, x_i, the large speculator observes his private signal, x_l, as before. Simultaneously and independently, they have to decide whether or not to attack the fixed parity, conditional on their respective private and public information. At the same time, the central bank has to decide whether or not to abandon the peg, based on her observation of θ and on the common knowledge about private information. There might be an additional third stage of the game, if the central bank at first did not decide to abandon the peg, the speculative mass, l, however, turned out to be too large to withstand a devaluation. Since a crisis is inevitable once this stage comes into play, we will abstract from this problem in the following and instead analyze the large trader's influence on a "premature" crisis.

There are several reasons for considering preemptive actions on the part of the central bank rather than consigning her to a purely reactive role. First of all, it has often been observed in past currency crises that central banks abandoned the peg even though they still had resources available for its defense (for instance in the 1992-93 ERM crisis). This behavior may be attributable to the political costs associated with a loss of confidence in the central bank following from a failed attempt to successfully defend the peg (Eichengreen and Rose, 2003). This might be particularly relevant if a single or a small number of large traders engage in a speculative attack against the parity so that the costs from defending the peg shoot up suddenly. Even though by acting preemptively the central bank runs the risk of a re- or devaluation of the currency peg that turns out to be unnecessary ex post, it might be advantageous for her to prevent a loss of control following from insurmountable speculative pressure that forces a disorderly abandonment of the fixed parity on her (Köhler, 2001). Additional reasons for acting early rather than late might be to hinder contagious crisis impacts on the banking system, the so-called twin crisis phenomenon (Kaminsky and Reinhart, 1999), and on related or neighboring countries.[12] These effects are usually stronger following an unexpected abandonment of a fixed parity than after a "controlled" devaluation.

[11] Angelotos et al. (2003) go even further by analyzing an endogenous choice of policy regime in a coordination game with homogeneous agents. In contrast to our approach, the government's choice serves as a signaling device and induces policy traps due to multiple equilibria, where the optimal regime is dictated by self-fulfilling market beliefs.

[12] For an overview of financial contagion effects see Pericoli and Sbracia (2003).

3.1 Derivation of Equilibrium

Both large and small speculators will want to attack the fixed parity whenever the expected payoff from this action is higher than the payoff from not attacking. All traders know that the central bank will abandon the fixed exchange rate if she expects the speculative mass attacking the peg to be sufficiently large: $E(l|\theta) \geq \theta$. Whether this condition is satisfied or not depends on both the realized fundamental state and the behavior of speculators. On the basis of private and public information, each player therefore has to try to establish the realized but unobservable fundamental state and the information of his counterparts and their subsequent actions. Given the assumed distribution of noise, we find that a small speculator with private signal x_i expects the unknown fundamental state to take on a value of

$$E(\theta|x_i) = \frac{\alpha}{\alpha+\beta}y + \frac{\beta}{\alpha+\beta}x_i \tag{6}$$

with variance

$$\text{Var}(\theta|x_i) = \frac{1}{\alpha+\beta}\,. \tag{7}$$

Each small speculator's posterior of θ is the average of his private and public information weighted by the relative precision of information. The more precise one type of information, the larger the weight that is attached to it. The same holds for each speculator's expectation about his opponents' private signals, since $E(x_j|x_i) = E(x_l|x_i) = E(\theta|x_i)$.[13] However, the variance that traders ascribe to their opponents' private signals is higher than the conditional variance of the fundamental state, i.e.

$$\text{Var}(x_j|x_i) = \frac{\alpha+2\beta}{\beta(\alpha+\beta)} > \text{Var}(\theta|x_i) \tag{8}$$

and

$$\text{Var}(x_l|x_i) = \frac{\alpha+\beta+\gamma}{\gamma(\alpha+\beta)} > \text{Var}(\theta|x_i)\,. \tag{9}$$

Similarly, we find for the large trader

$$E(\theta|x_l) = \frac{\alpha}{\alpha+\gamma}y + \frac{\gamma}{\alpha+\gamma}x_l \tag{10}$$

and

$$\text{Var}(\theta|x_l) = \frac{1}{\alpha+\gamma}\,. \tag{11}$$

Again, the large trader expects the small speculators to receive private signals equal to his posterior of θ: $E(x_i|x_l) = E(\theta|x_l)$. However, he also believes his opponents' private signals to have a higher variance than the fluctuations he ascribes to the fundamental state. This latter feature essentially drives the result of a unique equilibrium in this model. Although for certain values of the private signal an individual speculator will be sure that fundamentals are so weak that an attack on the fixed parity should almost certainly be successful, he cannot be sure that his opponents know this as well. What

[13] Indices i and j refer to small speculators, l to the large trader.

is more, even if he believes his opponents' signals to be sufficiently low, he still does not know whether they believe him to know what they know, etc.

We can now show that there exists exactly one value of the fundamental state, θ^*, which generates a distribution of private signals, so that each small speculator receiving signal $x_i = x^*$ is indifferent between attacking and not attacking, and the large speculator is indifferent between his two actions if he receives a signal of $x_l = x_l^*$. Whenever a fundamental state $\theta = \theta^*$ is realized, the central bank is indifferent between abandoning and keeping the peg.

The unique equilibrium is derived by simultaneously solving the indifference conditions for the central bank, the small speculators and the large trader. The central bank is indifferent between her two actions, if the expected speculative mass, $E(l|\theta)$, is exactly equal to the observed fundamental state, θ. If $E(l|\theta)$ is higher, the central bank will devalue the peg, if it is lower, she will defend the peg. In the following, we assume that speculators optimally follow trigger strategies around signals of x^*, respectively x_l^*.[14] Due to the defined structure of events, we find that the speculative mass condition is continuous. The central bank is indifferent between abandoning and keeping the peg, if

$$\begin{aligned} \theta^* &= (1-\lambda)\cdot \text{prob}(x \leq x^*|\theta^*) + \lambda \cdot \text{prob}(x_l \leq x_l^*|\theta^*) \\ &= (1-\lambda)\cdot \Phi\Big(\sqrt{\beta}(x^* - \theta^*)\Big) + \lambda \cdot \Phi\Big(\sqrt{\gamma}(x_l^* - \theta^*)\Big)\ . \end{aligned} \tag{12}$$

The first term on the r.h.s. of (12) gives the proportion of small speculators that attack the peg. Due to the assumed independence of private signals, this fraction is equivalent to the probability with which one single small trader attacks the fixed parity. The second expression on the r.h.s. of (12) represents the probability with which the large speculator attacks the currency peg.

Note that for the model with only small speculators, i.e. for $\lambda = 0$, it does not matter whether the central bank decides on her action before or after observing the number of attacking speculators. This follows from the fact that in a model with a continuum of small traders and independently distributed noise parameters, the expected proportion of attacking speculators is equal to the actual proportion of attacking traders in equilibrium.[15] Hence, for a continuum of homogeneous traders there is no aggregate uncertainty. In the model with heterogeneous traders, however, a continuous speculative mass condition requires the possibility of preemptive action on the part of the central bank.

Whereas the indifference condition of the large speculator stays the same as in the previous section

$$\begin{aligned} D\cdot \text{prob}(\theta \leq \theta^*|x_l) &= t \\ D\cdot \Phi(\sqrt{\alpha+\gamma}(\theta^* - \frac{\alpha}{\alpha+\gamma}y - \frac{\gamma}{\alpha+\gamma}x_l)) &= t\ , \end{aligned} \tag{13}$$

the condition of indifference for the small speculators is different from the one in section 2. Since the structure of the game is common knowledge, speculators know that the

[14] For a general proof of trigger strategies being optimal for the actors in such a game with incomplete information see Morris and Shin (2004).

[15] For a detailed analysis of this fact see Morris and Shin (2000) or Metz (2002).

speculative mass condition is no longer a step function, jumping up by λ if the large trader decides to join the attack. Instead, they know that the probability of a successful attack only depends on whether the realized fundamental state is lower than or equal to the threshold value θ^*. The small speculators' indifference condition is therefore given by

$$\begin{aligned} D \cdot \text{prob}(\theta \leq \theta^* | x_i) &= t \\ D \cdot \Phi(\sqrt{\alpha+\beta}(\theta^* - \frac{\alpha}{\alpha+\beta} y - \frac{\beta}{\alpha+\beta} x_i)) &= t \,. \end{aligned} \tag{14}$$

In contrast to the asymmetric approach of section 2, large and small traders now take account of their opponents' actions in a symmetric way. Due to the continuous indifference condition for the central bank, a unique value for the fundamental state can be derived up to which the fixed parity will always be abandoned. Based on this single threshold state θ^*, unique switching values for the private signals, x_l^* and x^*, can be calculated. Each speculator will attack the fixed parity up to this value. Note that for the equilibrium to be unique, it is required that private signals are sufficiently precise relative to public information,[16] i.e. $\beta, \gamma > \frac{\alpha^2}{2\pi}$.

The equilibrium values, derived from indifference conditions (12), (13) and (14), are given as follows

$$\begin{aligned} \theta^* &= (1-\lambda)\Phi_1\left(\frac{\alpha}{\sqrt{\beta}}\theta^* - \frac{\alpha}{\sqrt{\beta}} y - \sqrt{\frac{\alpha+\beta}{\beta}}\Phi^{-1}\Big(\frac{t}{D}\Big)\right) \\ &\quad + \lambda\Phi_2\left(\frac{\alpha}{\sqrt{\gamma}}\theta^* - \frac{\alpha}{\sqrt{\gamma}} y - \sqrt{\frac{\alpha+\gamma}{\gamma}}\Phi^{-1}\Big(\frac{t}{D}\Big)\right), \end{aligned} \tag{15}$$

$$x^* = \frac{\alpha+\beta}{\beta}\theta^* - \frac{\alpha}{\beta} y - \frac{\sqrt{\alpha+\beta}}{\beta}\Phi^{-1}\Big(\frac{t}{D}\Big), \tag{16}$$

$$x_l^* = \frac{\alpha+\gamma}{\gamma}\theta^* - \frac{\alpha}{\gamma} y - \frac{\sqrt{\alpha+\gamma}}{\gamma}\Phi^{-1}\Big(\frac{t}{D}\Big). \tag{17}$$

3.2 Large Trader and Market Sentiment

This section derives the main results regarding the influence of a large trader on the incidence of a currency crisis under the assumption that the conditions for uniqueness of equilibrium are satisfied. Since a devaluation will take place for all fundamental values lower than or equal to θ^*, each parameter that increases θ^* subsequently raises the ex ante probability of a crisis.

The main findings of the symmetric approach are presented in propositions 4 and 5. They show that the large trader's impact on a currency crisis is contingent on the prevailing market sentiment with regard to the fundamental development of the economy.

[16] The proof of uniqueness of the derived equilibrium is given in appendix 1 to this paper, available on the internet at http://www.finance.uni-frankfurt.de/pers/bannier.html.

Proposition 4 *For* $\theta^* > (<) y + \frac{\sqrt{\beta(\alpha+\gamma)}-\sqrt{\gamma(\alpha+\beta)}}{\alpha(\sqrt{\beta}-\sqrt{\gamma})}\Phi^{-1}(\frac{t}{D})$ *the large trader's size,* λ*, has a positive (negative) influence on the probability of a currency crisis.*

Proof:

$$\frac{\partial\theta^*}{\partial\lambda} = \frac{\Phi_2(\cdot)-\Phi_1(\cdot)}{1-(1-\lambda)\phi_1(\cdot)\frac{\alpha}{\sqrt{\beta}}-\lambda\phi_2(\cdot)\frac{\alpha}{\sqrt{\gamma}}} \tag{18}$$

This partial derivative is positive if $\Phi_2(\cdot) > \Phi_1(\cdot)$, which implies that θ^* has to be higher than $y + \frac{\sqrt{\beta(\alpha+\gamma)}-\sqrt{\gamma(\alpha+\beta)}}{\alpha(\sqrt{\beta}-\sqrt{\gamma})}\Phi^{-1}(\frac{t}{D})$. The opposite holds for a negative value of the derivative. ■

Hence, the large trader's size has a positive influence on the ex ante probability of a crisis, if the switching value θ^* is sufficiently high. Denote as y_λ the value of the prior mean for which $\theta^*(y_\lambda) = y_\lambda + \frac{\sqrt{\beta(\alpha+\gamma)}-\sqrt{\gamma(\alpha+\beta)}}{\alpha(\sqrt{\beta}-\sqrt{\gamma})}\Phi^{-1}(\frac{t}{D})$. Whenever the commonly expected fundamental state is higher than y_λ, the ex ante probability of a crisis decreases in the size of the large trader. For a prior mean below y_λ the reverse holds. Hence, the large trader may render the market more aggressive, but he need not necessarily do so. He makes market responses more aggressive only if the market believes fundamentals to be weak, i.e. if the market sentiment y is sufficiently low. In an optimistic market, in contrast, the presence of a large speculator decreases the ex ante probability of a crisis. Note that the effect of the large player's size is independent of his informational position - a result that is in contrast to the findings of the asymmetric approach by CDMS (2004) and CPR (2002). Even without completely precise information about the economic state, the large trader coordinates market responses so that small traders attack for higher values of private information.

Proposition 5 *The market sentiment,* y*, exerts a negative influence on the probability of a currency crisis. The negative effect of* y *increases (decreases) in the size,* λ*, of the large trader, if the precision of his private information is sufficiently low (high) relative to the precision of the small traders' private information.*

Proof:

$$\frac{\partial\theta^*}{\partial y} = -\frac{(1-\lambda)\phi_1(\cdot)\frac{\alpha}{\sqrt{\beta}}+\lambda\phi_2(\cdot)\frac{\alpha}{\sqrt{\gamma}}}{1-(1-\lambda)\phi_1(\cdot)\frac{\alpha}{\sqrt{\beta}}-\lambda\phi_2(\cdot)\frac{\alpha}{\sqrt{\gamma}}} < 0 \tag{19}$$

and

$$\frac{\partial\frac{\partial\theta^*}{\partial y}}{\partial\lambda} = \frac{\phi_1(\cdot)\frac{\alpha}{\sqrt{\beta}}-\phi_2(\cdot)\frac{\alpha}{\sqrt{\gamma}}}{[1-(1-\lambda)\phi_1(\cdot)\frac{\alpha}{\sqrt{\beta}}-\lambda\phi_2(\cdot)\frac{\alpha}{\sqrt{\gamma}}]^2} \tag{20}$$

The latter partial derivative is positive (negative), whenever $\sqrt{\gamma} > (<)\sqrt{\beta}\frac{\phi_2(\cdot)}{\phi_1(\cdot)}$. ■

The stronger the commonly expected fundamental state y, i.e. the more optimistic the market sentiment, the lower is the prior probability of a currency crisis and vice versa.

The large trader's size does not change the sign of this effect. But his presence increases the market sentiment's impact if the accuracy of his private information, γ, is low relative to that of the continuum of small speculators. In contrast, if the precision of his private information is high, the negative effect of y on the probability of a crisis decreases. For an interpretation of this result, consider that traders attack the fixed parity only if this decision is justified by a high probability of success, i.e. for a sufficiently low expected value of the economic state, $E(\theta|x)$. Since the distribution of private signals is common knowledge, small speculators know that the less precise the large trader's private information the more strongly he will base his decision on whether or not to attack on the common prior y rather than his private signal x_l. Therefore, a high prior mean y combined with low precision γ of the large trader's private signal not only makes small speculators generally optimistic about the fundamental state. They are then also sure that the large player will hold an optimistic posterior belief concerning θ. Hence, the market will tend to refrain from attacking, so that θ^* decreases quite strongly.

As can be seen from the following corollaries, the market sentiment also plays a role for the impact of the traders' information precision on the ex ante probability of a crisis.[17]

Corollary 1 *For* $\theta^* > \max\{y + \frac{1}{2}\frac{1}{\sqrt{\alpha+\beta}}\Phi^{-1}(\frac{t}{D}), y + \frac{1}{2}\frac{1}{\sqrt{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D})\}$ *the precision of the public signal,* α*, has a positive influence on the probability of a currency crisis. For* $\theta^* < \min\{y + \frac{1}{2}\frac{1}{\sqrt{\alpha+\beta}}\Phi^{-1}(\frac{t}{D}), y + \frac{1}{2}\frac{1}{\sqrt{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D})\}$ *precision* α *has a negative influence on the crisis probability. For both sufficiently low and high values* θ^**, the influence of* α *is strengthened by the large player's size,* λ*.*

For low values of the prior mean y, i.e. for a pessimistic market sentiment, θ^* will very likely be higher than the respective threshold value, so that the precision of public information exerts a positive influence on the danger of a crisis. For an optimistic market sentiment, i.e. for high values of y, the reverse holds. This result follows from the fact that a higher precision of public information induces both types of traders to place larger weight on the prior mean y in determining their posterior expectation of θ. High prior means therefore will decrease the incentive to attack the more precise public information is, so that the danger of a currency crisis is reduced. In case of low prior means, in contrast, the danger of a crisis rises in the precision of public information, i.e. in the weight attached to this part of information. The market power of the large trader strengthens the influence of α on the crisis probability, since a higher value of λ reduces the remaining share of the market that has to be coordinated on either of the two actions, based on the commonly available public information.

Corollary 2 *The precision of small speculators' private information,* β*, exerts a negative (positive) influence on the crisis probability, if* $\theta^* > (<) y + \frac{1}{\sqrt{\alpha+\beta}}\Phi^{-1}(\frac{t}{D})$*. For both low and high values of* θ^**, the influence of precision* β *decreases in the size of the large trader,* λ*.*

[17] The proofs can be obtained from appendix 2 to this paper, available on the internet at http://www.finance.uni-frankfurt.de/pers/bannier.html.

Let y_β be the value of the prior mean for which $\theta^*(y_\beta) = y_\beta + \frac{1}{\sqrt{\alpha+\beta}}\Phi^{-1}(\frac{t}{D})$. For all prior means lower than y_β, the probability of a currency crisis decreases in the precision of small speculators' private information, whereas for all prior means above y_β, the probability of a crisis increases in β. The higher precision β, the more weight will the small traders attach to their private signals x_i in order to calculate $E(\theta|x)$. Hence, if private information is very precise relative to public information, speculators will tend to neglect the market sentiment. This reduces small traders' incentive to attack whenever the market believes fundamentals to be weak, so that the probability of a crisis is diminished. The opposite holds for an optimistic market sentiment, i.e. for $y > y_\beta$, where a less strong consideration of the prior mean y increases small traders' inclination to attack the parity.

However, variations in β influence only small traders' behavior directly and hence may move a market fraction of maximally $1 - \lambda$. Even for completely precise private information by small speculators, the large trader will still take into account the market sentiment when deciding on whether or not to attack. The larger his financial power λ, therefore, the more limited is the impact that β has on the crisis probability.

Finally, for the precision of the large trader's private information the following corollary holds:

Corollary 3 *The precision of the large trader's private information, γ, reduces (raises) the probability of a currency crisis, if $\theta^* > (<) y + \frac{1}{\sqrt{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D})$. The influence of precision γ on θ^* decreases along with the size of the large trader, λ, for both sufficiently pessimistic and optimistic market sentiment.*

Define y_γ as the prior mean for which $\theta^*(y_\gamma) = y_\gamma + \frac{1}{\sqrt{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D})$. Whenever the market sentiment is lower than y_γ, the danger of a currency crisis decreases in the precision of the large trader's private information. In contrast, if the prior mean is higher than y_γ, the crisis probability increases in γ. Again, the more precise the large trader's private information, the less weight he will attach to the market sentiment in order to decide on whether to attack or not. This reduces his inclination to attack when the market believes fundamentals to be weak but increases his aggressiveness if the market sentiment is optimistic with regard to economic fundamentals.

For both sufficiently optimistic and pessimistic market sentiment, the influence of γ on the crisis probability decreases along with the large trader's market share, λ. Due to strategic complementarities in speculators' payoff functions, the large trader wishes to increase the probability of gaining λD from a successful attack by enabling a sufficient amount of coordination among speculators. Since coordination of actions can only follow along the public part of information, he will still put considerable weight on the common prior mean y even if his private information becomes more and more precise. This reduces the impact of γ on θ^*.

4 Conclusion

When analyzing the role of large players such as big hedge funds in financial crises, previous studies mainly concentrated on disentangling the effects of two characteristics of large traders: their size and their potential informational advantage. The models by CDMS (2004) and CPR (2002) arrived at the result that a large trader makes a speculative attack on a fixed currency more likely if his market power is sufficiently high or if he has more precise fundamental information relative to the rest of the market. However, these results were derived from a model where heterogeneous traders take into account their opponents' actions non-symmetrically. Moreover, empirical studies did not substantiate the clear-cut findings of these theoretical models. Instead of always increasing the aggressiveness of the market, large hedge funds were mostly found to behave in accordance with fundamentals, attacking only those currencies that had already shown a fundamental tendency to devalue (IMF, 1998).

In this paper, a new "symmetric" approach to analyzing a large player's impact on financial crises emphasizes one major new insight: a large trader may but need not necessarily make market responses more aggressive. Rather, his influence depends on the market sentiment, i.e. on the market's general assessment of the economy. Whenever the market commonly believes that fundamentals are weak, the probability of a currency crisis increases along with the large trader's size but decreases in the precision of his information. If fundamentals are perceived to be strong, in contrast, the danger of a crisis depends negatively on the large speculator's market power and positively on the accuracy of his information. Both the large trader's size and his informational position therefore exert an influence on the likelihood of a currency crisis that is contingent on the market sentiment.

In particular, the "size effect" supports the observation that large traders tend to act in accordance with fundamentals rather than trying to manipulate market responses against the fundamental development of the economy. However, if large traders indeed possess superior information about economic fundamentals, as is often assumed, they might reduce the beneficial effect that a strengthening market sentiment generally has on preventing currency crises. Yet, they will never reverse it.

The symmetric approach hence paints a much richer picture of a large trader's role in financial crises compared to earlier studies. It follows from our theoretical results that the worst case for a central bank trying to prevent a speculative attack on the fixed parity is a large uninformed trader acting in a generally pessimistic market. In such a situation, both his financial power and his informational position make market responses more aggressive. Our model, which mirrors the high complexity of decision-making on financial markets, highlights the importance of monitoring not only the actions of large and influential market participants but also the general market sentiment. According to the theoretical findings, it is not the existence of either factor in isolation, but rather their coexistence that renders financial markets vulnerable to the presence of large traders.

References

[1] Angelotos, G.-M., C. Hellwig and A. Pavan, 2003, Coordination and policy traps, NBER Working Paper No. 9767.

[2] Carlsson, H. and E. van Damme, 1993, Global games and equilibrium selection, Econometrica 61, 989-1018.

[3] Corsetti, G., A. Dasgupta, S. Morris and H. S. Shin, 2004, Does one Soros make a difference? A theory of currency crises with large and small traders, Review of Economic Studies 71, 87-114. Earlier version available at http://cowles.econ.yale.edu/P/cd/d12b/d1273.pdf.

[4] Corsetti, G., P. Pesenti and N. Roubini, 2002, The role of large players in currency crises, in: S. Edwards and J. Frankel, eds., Preventing currency crises in emerging markets (Chicago University Press, Chicago).

[5] Eichengreen, B. and A. Rose, 2003, Does it pay to defend against a speculative attack? In: J. Frankel and M. Dooley, eds., Managing currency crises in emerging markets (Chicago University Press, Chicago).

[6] Financial Stability Forum (FSF), 2000, Report of the Market Dynamics Study Group of the FSF Working Group on Highly Leveraged Institutions, http://www.fsforum.org/Reports/RepHLI.html.

[7] Fung, W., D. A. Hsieh and K. Tsatsaronis, 2000, Do hedge funds disrupt emerging markets? Brookings-Wharton Papers on Financial Services 2000, 377-421.

[8] International Monetary Fund, 1998, Hedge funds and financial market dynamics, IMF Occasional Paper No. 166.

[9] Kaminsky, G. and C. Reinhart, 1999, The twin crises: the causes of banking and balance-of-payments problems, American Economic Review 89, 473-500.

[10] Köhler, H., 2001, New challenges for exchange rate policy, remarks at the Asia-Europe Meeting of Finance Ministers, Kobe, 13 January, http://www.mof.go.jp/english/asem/aseme03a1.htm.

[11] Metz, C. E., 2002, Private and public information in self-fulfilling currency crises, Journal of Economics 76, 65-85.

[12] Metz, C. E., 2003, Information dissemination in currency crises (Springer, Berlin Heidelberg New York).

[13] Morris, S. and H. S. Shin, 1998, Unique equilibrium in a model of self-fulfilling currency attacks, American Economic Review 88, 587-597.

[14] Morris, S. and H. S. Shin, 2000, Global games: theory and applications, in: M. Dewatripont, L. Hansen and S. Turnovsky, eds., Advances in economics and econometrics, the Eighth World Congress (Cambridge University Press, Cambridge Mass.).

[15] Morris, S. and H. S. Shin, 2004, Coordination risk and the price of debt, European Economic Review 48, 133-153.

[16] Pericoli, M. and M. Sbracia, 2003, A primer on financial contagion, Journal of Economic Surveys 17, 571-608.

Appendix 1

Uniqueness of equilibrium requires that there exists only one combination of signals and fundamentals, which simultaneously make the central bank and the speculators indifferent between their respective actions. The uniqueness condition is given as a three-dimensional problem. However, since only the central bank's indifference condition contains all three dimensions, the task reduces to showing that there is only one intersection point of the central bank's indifference curve with each of the speculators' indifference curves.

Let us first consider the simultaneous indifference situation of central bank and small speculators. Solving the central bank's indifference condition (12) for x^*, gives

$$x^{*CB} = \theta^* + \frac{1}{\sqrt{\beta}}\Phi_a^{-1}\left(\frac{\theta^* - \lambda\Phi_b(\sqrt{\gamma}(x_l^* - \theta^*))}{1-\lambda}\right),$$

with Φ_a denoting the first cumulated normal density on the right hand side in equation (12) and Φ_b denoting the second.

The small speculators' indifference condition follows from (14) as

$$x^{*SPs} = \frac{\alpha+\beta}{\beta}\theta^* - \frac{\alpha}{\beta}y - \frac{\sqrt{\alpha+\beta}}{\beta}\Phi^{-1}\Big(\frac{t}{D}\Big).$$

Figure 1 shows the two indifference curves in the (θ, x)-plane. We can see that there is exactly one intersection of the two curves, if the speculators' indifference curve has a smaller slope throughout the whole range of values. The slope of the central bank's indifference curve is given by

$$\frac{\partial x^{*CB}}{\partial \theta^*} = 1 + \frac{1}{\sqrt{\beta}}\phi_a^{-1}(\cdot)\Big(\frac{1}{1-\lambda} - \frac{\lambda}{1-\lambda}\phi_b(\cdot)(\sqrt{\gamma}\frac{\partial x_l^*}{\partial \theta^*} - \sqrt{\gamma})\Big),$$

and for the speculators' indifference curve by

$$\frac{\partial x^{*SPs}}{\partial \theta^*} = \frac{\alpha+\beta}{\beta}.$$

Thus, a unique intersection point of the central bank's and the small speculators' indifference curve is guaranteed if

$$1 + \frac{1}{\sqrt{\beta}}\phi_a^{-1}(\cdot)\Big(\frac{1}{1-\lambda} - \frac{\lambda}{1-\lambda}\phi_b(\cdot)(\sqrt{\gamma}\frac{\partial x_l^*}{\partial \theta^*} - \sqrt{\gamma})\Big) > \frac{\alpha+\beta}{\beta}.$$

Bearing in mind that the smallest value of $\phi^{-1}(\cdot)$ is equal to the reciprocal of the largest value of $\phi(\cdot)$, which is given at the mean μ, $\frac{1}{\phi(\mu)} = \frac{1}{\frac{1}{\sigma\sqrt{2\pi}}}$ with σ denoting the standard deviation of the respective normally distributed value, whereas the smallest value of $\phi(\cdot)$ is simply given by zero, we find as a sufficient condition

$$\beta > \frac{\alpha^2}{2\pi}.$$

Analyzing the simultaneous indifference situation for the central bank and the single large trader in the same way, we get the second sufficient condition for uniqueness of equilibrium

$$\gamma > \frac{\alpha^2}{2\pi} \, .$$

A unique equilibrium in our model is thus guaranteed if the precision of both types of private information is high relative to the precision of public information. The equilibrium threshold values (θ^*, x^*, x_l^*) divide the strategy space into two regions, so that for all $\theta \leq \theta^*$ strategy *abandon the peg* dominates strategy *keep the peg* and for all signals x_i and x_l smaller than or equal to the threshold values x^* and x_l^* strategy *attack the peg* dominates strategy *do not attack*.

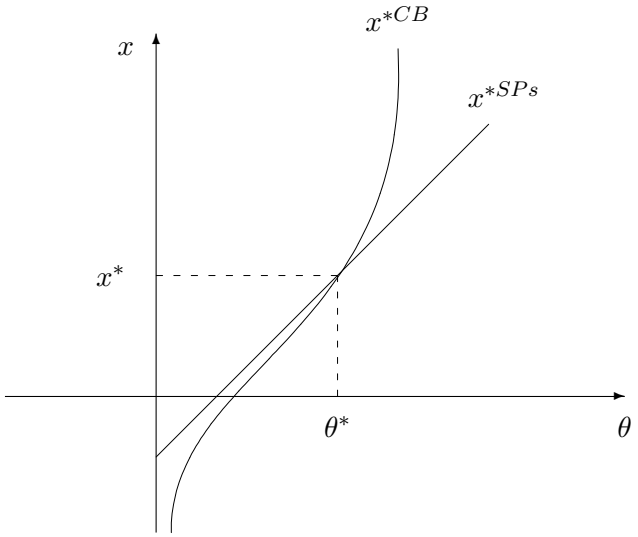

Figure 1: Unique Equilibrium - Central Bank and Small Speculators

Appendix 2

Proof of corollary 1:

$$\frac{\partial \theta^*}{\partial \alpha} = \frac{(1-\lambda)\phi_1(\cdot)\Big(\frac{1}{\sqrt{\beta}}\theta^* - \frac{1}{\sqrt{\beta}}y - \frac{1}{2\beta}\sqrt{\frac{\beta}{\alpha+\beta}}\Phi^{-1}(\frac{t}{D})\Big)}{1-(1-\lambda)\phi_1(\cdot)\frac{\alpha}{\sqrt{\beta}} - \lambda\phi_2(\cdot)\frac{\alpha}{\sqrt{\gamma}}}$$
$$+\frac{\lambda\phi_2(\cdot)\Big(\frac{1}{\sqrt{\gamma}}\theta^* - \frac{1}{\sqrt{\gamma}}y - \frac{1}{2\gamma}\sqrt{\frac{\gamma}{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D})\Big)}{1-(1-\lambda)\phi_1(\cdot)\frac{\alpha}{\sqrt{\beta}} - \lambda\phi_2(\cdot)\frac{\alpha}{\sqrt{\gamma}}}$$

The partial derivative of θ^* with respect to α is positive, whenever $\theta^* > y + \frac{1}{2}\frac{1}{\sqrt{\alpha+\beta}}\Phi^{-1}(\frac{t}{D})$ and $\theta^* > y + \frac{1}{2}\frac{1}{\sqrt{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D})$. However, it is negative, whenever $\theta^* < y + \frac{1}{2}\frac{1}{\sqrt{\alpha+\beta}}\Phi^{-1}(\frac{t}{D})$ and $\theta^* < y + \frac{1}{2}\frac{1}{\sqrt{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D})$. Note, that these conditions for the effect of α on θ^* are sufficient but not necessary for the influence being positive or negative respectively.

Taking account of higher-order effects of λ on θ^*, it holds for the influence of the large player's size on the impact of the precision of public information that

$$\begin{aligned}
\frac{\partial^2\theta^*}{\partial\lambda\partial\alpha} \;=\; & \frac{\phi_1(\cdot)\Big[\Big(\frac{1}{\sqrt{\beta}}\theta^* - \frac{1}{\sqrt{\beta}}y - \frac{1}{2\beta}\sqrt{\frac{\beta}{\alpha+\beta}}\Phi^{-1}(\frac{t}{D})\Big)\Big((1-\lambda)\frac{\alpha}{\sqrt{\beta}}\frac{\partial\theta^*}{\partial\lambda} - 1\Big) + (1-\lambda)\frac{1}{\sqrt{\beta}}\frac{\partial\theta^*}{\partial\lambda}\Big]}{1-(1-\lambda)\phi_1(\cdot)\frac{\alpha}{\sqrt{\beta}} - \lambda\phi_2(\cdot)\frac{\alpha}{\sqrt{\gamma}}} \\
& + \frac{\phi_2(\cdot)\Big[\Big(\frac{1}{\sqrt{\gamma}}\theta^* - \frac{1}{\sqrt{\gamma}}y - \frac{1}{2\gamma}\sqrt{\frac{\gamma}{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D})\Big)\Big(1+\lambda\frac{\alpha}{\sqrt{\gamma}}\frac{\partial\theta^*}{\partial\lambda}\Big) + \lambda\frac{1}{\sqrt{\gamma}}\frac{\partial\theta^*}{\partial\lambda}\Big]}{1-(1-\lambda)\phi_1(\cdot)\frac{\alpha}{\sqrt{\beta}} - \lambda\phi_2(\cdot)\frac{\alpha}{\sqrt{\gamma}}} \\
& - \Bigg[(1-\lambda)\phi_1(\cdot)\Big(\frac{1}{\sqrt{\beta}}\theta^* - \frac{1}{\sqrt{\beta}}y - \frac{1}{2\beta}\sqrt{\frac{\beta}{\alpha+\beta}}\Phi^{-1}(\frac{t}{D})\Big) \\
& \qquad + \lambda\phi_2(\cdot)\Big(\frac{1}{\sqrt{\gamma}}\theta^* - \frac{1}{\sqrt{\gamma}}y - \frac{1}{2\gamma}\sqrt{\frac{\gamma}{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D})\Big)\Bigg] \\
& \cdot \frac{\phi_1(\cdot)\frac{\alpha}{\sqrt{\beta}}(1-(1-\lambda)\frac{\alpha}{\sqrt{\beta}}\frac{\partial\theta^*}{\partial\lambda}) - \phi_2(\cdot)\frac{\alpha}{\sqrt{\gamma}}(1+\lambda\frac{\alpha}{\sqrt{\gamma}}\frac{\partial\theta^*}{\partial\lambda})}{\Big[1-(1-\lambda)\phi_1(\cdot)\frac{\alpha}{\sqrt{\beta}} - \lambda\phi_2(\cdot)\frac{\alpha}{\sqrt{\gamma}}\Big]^2}
\end{aligned}$$

This cross partial derivative is positive for both high and low values of θ^*, i.e. for

$$\theta^* > \max\begin{cases}
y + \frac{1}{2}\frac{1}{\sqrt{\alpha+\beta}}\Phi^{-1}(\frac{t}{D}), \\
y + \frac{1}{2}\frac{1}{\sqrt{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D}), \\
y + \frac{1}{2}\frac{1}{\sqrt{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D}) - \frac{\lambda\frac{\partial\theta^*}{\lambda}}{1+\lambda\frac{\alpha}{\sqrt{\gamma}}\frac{\partial\theta^*}{\partial\lambda}}, \\
y + \frac{\sqrt{\alpha+\gamma}}{\alpha}\Phi^{-1}(\frac{t}{D}) + \frac{\sqrt{\gamma}}{\alpha}\Phi^{-1}\Big(\Phi_1(\cdot) + \frac{\sqrt{\beta}}{(1-\lambda)\alpha} - \phi_1(\cdot) - \frac{\lambda}{1-\lambda}\sqrt{\frac{\beta}{\gamma}}\phi_2(\cdot)\Big), \\
y + \frac{\sqrt{\alpha+\gamma}}{\alpha}\Phi^{-1}(\frac{t}{D}) + \frac{\sqrt{\gamma}}{\alpha}\Phi^{-1}\Big(\Phi_1(\cdot) - \frac{\sqrt{\gamma}}{\lambda\alpha} + \frac{1-\lambda}{\lambda}\sqrt{\frac{\gamma}{\beta}}\phi_1(\cdot) + \phi_2(\cdot)\Big), \\
y + \frac{\sqrt{\alpha+\gamma}}{\alpha}\Phi^{-1}(\frac{t}{D}) + \frac{\sqrt{\gamma}}{\alpha}\Phi^{-1}\Big(\Phi_1(\cdot) + \frac{\phi_1(\cdot)[\sqrt{\gamma}-(1-\lambda)\alpha\sqrt{\frac{\gamma}{\beta}}\phi_1(\cdot)] - \phi_2(\cdot)[\sqrt{\beta}-\lambda\alpha\sqrt{\frac{\beta}{\gamma}}\phi_2(\cdot) - \alpha\phi_1(\cdot)(1-2\lambda)]}{(1-\lambda)\alpha\sqrt{\frac{\gamma}{\beta}}\phi_1(\cdot) + \lambda\alpha\sqrt{\frac{\beta}{\gamma}}\phi_2(\cdot)}\Big)
\end{cases}$$

and for

$$\theta^* < \min \begin{cases} y + \frac{1}{2}\frac{1}{\sqrt{\alpha+\beta}}\Phi^{-1}(\frac{t}{D}), \\ y + \frac{1}{2}\frac{1}{\sqrt{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D}), \\ y + \frac{1}{2}\frac{1}{\sqrt{\alpha+\beta}}\Phi^{-1}(\frac{t}{D}) + \frac{(1-\lambda)\frac{\partial\theta^*}{\partial\lambda}}{1-(1-\lambda)\frac{\alpha}{\sqrt{\beta}}\frac{\partial\theta^*}{\partial\lambda}}, \\ y + \frac{1}{2}\frac{1}{\sqrt{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D}) - \frac{\lambda\frac{\partial\theta^*}{\lambda}}{1+\lambda\frac{\alpha}{\sqrt{\gamma}}\frac{\partial\theta^*}{\partial\lambda}}, \\ y + \frac{\sqrt{\alpha+\gamma}}{\alpha}\Phi^{-1}(\frac{t}{D}) + \frac{\sqrt{\gamma}}{\alpha}\Phi^{-1}\Big(\Phi_1(\cdot) + \frac{\sqrt{\beta}}{(1-\lambda)\alpha} - \phi_1(\cdot) - \frac{\lambda}{1-\lambda}\sqrt{\frac{\beta}{\gamma}}\phi_2(\cdot)\Big), \\ y + \frac{\sqrt{\alpha+\gamma}}{\alpha}\Phi^{-1}(\frac{t}{D}) + \frac{\sqrt{\gamma}}{\alpha}\Phi^{-1}\Big(\Phi_1(\cdot) - \frac{\sqrt{\gamma}}{\lambda\alpha} + \frac{1-\lambda}{\lambda}\sqrt{\frac{\gamma}{\beta}}\phi_1(\cdot) + \phi_2(\cdot)\Big), \\ y + \frac{\sqrt{\alpha+\gamma}}{\alpha}\Phi^{-1}(\frac{t}{D}) + \frac{\sqrt{\gamma}}{\alpha}\Phi^{-1}\Big(\Phi_1(\cdot) + \frac{\phi_1(\cdot)[\sqrt{\gamma}-(1-\lambda)\alpha\sqrt{\frac{\gamma}{\beta}}\phi_1(\cdot)]-\phi_2(\cdot)[\sqrt{\beta}-\lambda\alpha\sqrt{\frac{\beta}{\gamma}}\phi_2(\cdot)-\alpha\phi_1(\cdot)(1-2\lambda)]}{(1-\lambda)\alpha\sqrt{\frac{\gamma}{\beta}}\phi_1(\cdot)+\lambda\alpha\sqrt{\frac{\beta}{\gamma}}\phi_2(\cdot)}\Big) \end{cases}$$

Q.E.D.

Proof of corollary 2:

$$\frac{\partial\theta^*}{\partial\beta} = \frac{(1-\lambda)\phi_1(\cdot)\left(-\frac{\alpha}{2\sqrt{\beta^3}}\theta^* + \frac{\alpha}{2\sqrt{\beta^3}}y + \frac{\alpha}{2\beta^2}\sqrt{\frac{\beta}{\alpha+\beta}}\Phi^{-1}(\frac{t}{D})\right)}{1-(1-\lambda)\phi_1(\cdot)\frac{\alpha}{\sqrt{\beta}} - \lambda\phi_2(\cdot)\frac{\alpha}{\sqrt{\gamma}}}$$

The partial derivative of θ^* with respect to β is negative, whenever $\theta^* > y + \frac{1}{\sqrt{\alpha+\beta}}\Phi^{-1}(\frac{t}{D})$, but positive if θ^* is lower than the threshold function.

For the influence of the large trader's size on this partial derivative, we find

$$\begin{aligned}\frac{\partial^2\theta^*}{\partial\lambda\partial\beta} = {} & \frac{\phi_1(\cdot)\left[\left(-\frac{\alpha}{2\sqrt{\beta^3}}\theta^* + \frac{\alpha}{2\sqrt{\beta^3}}y + \frac{\alpha}{2\beta^2}\sqrt{\frac{\beta}{\alpha+\beta}}\Phi^{-1}(\frac{t}{D})\right)\cdot\left((1-\lambda)\frac{\alpha}{\sqrt{\beta}}\frac{\partial\theta^*}{\partial\lambda} - 1\right) - (1-\lambda)\frac{\alpha}{2\sqrt{\beta^3}}\frac{\partial\theta^*}{\partial\lambda}\right]}{1-(1-\lambda)\phi_1(\cdot)\frac{\alpha}{\sqrt{\beta}} - \lambda\phi_2(\cdot)\frac{\alpha}{\sqrt{\gamma}}} \\ & -(1-\lambda)\phi_1(\cdot)\Big(-\frac{\alpha}{2\sqrt{\beta^3}}\theta^* + \frac{\alpha}{2\sqrt{\beta^3}}y + \frac{\alpha}{2\beta^2}\sqrt{\frac{\beta}{\alpha+\beta}}\Phi^{-1}(\frac{t}{D})\Big) \\ & \qquad \cdot\frac{\phi_1(\cdot)\frac{\alpha}{\sqrt{\beta}}(1-(1-\lambda)\frac{\alpha}{\sqrt{\beta}}\frac{\partial\theta^*}{\partial\lambda}) - \phi_2(\cdot)\frac{\alpha}{\sqrt{\gamma}}(1+\lambda\frac{\alpha}{\sqrt{\gamma}}\frac{\partial\theta^*}{\partial\lambda})}{[1-(1-\lambda)\phi_1(\cdot)\frac{\alpha}{\sqrt{\beta}} - \lambda\phi_2(\cdot)\frac{\alpha}{\sqrt{\gamma}}]^2}\end{aligned}$$

This cross partial derivative is negative for both small and high values of θ^*, i.e. for

$$\theta^* > \max \begin{cases} y + \frac{1}{\sqrt{\alpha+\beta}}\Phi^{-1}(\frac{t}{D}), \\ y + \frac{\sqrt{\alpha+\gamma}}{\alpha}\Phi^{-1}(\frac{t}{D}) + \frac{\sqrt{\gamma}}{\alpha}\Phi^{-1}\Big(\Phi_1(\cdot) + \frac{\sqrt{\beta}}{(1-\lambda)\alpha} - \phi_1(\cdot) - \frac{\lambda}{1-\lambda}\sqrt{\frac{\beta}{\gamma}}\phi_2(\cdot)\Big), \\ y + \frac{\sqrt{\alpha+\gamma}}{\alpha}\Phi^{-1}(\frac{t}{D}) + \frac{\sqrt{\gamma}}{\alpha}\Phi^{-1}\Big(\Phi_1(\cdot) + \frac{\phi_1(\cdot)[\sqrt{\gamma}-(1-\lambda)\alpha\sqrt{\frac{\gamma}{\beta}}\phi_1(\cdot)]-\phi_2(\cdot)[\sqrt{\beta}-\lambda\alpha\sqrt{\frac{\beta}{\gamma}}\phi_2(\cdot)-\alpha\phi_1(\cdot)(1-2\lambda)]}{(1-\lambda)\alpha\sqrt{\frac{\gamma}{\beta}}\phi_1(\cdot)+\lambda\alpha\sqrt{\frac{\beta}{\gamma}}\phi_2(\cdot)}\Big) \end{cases}$$

and for

$$\theta^* < \min \begin{cases} y + \frac{1}{\sqrt{\alpha+\beta}}\Phi^{-1}(\frac{t}{D}), \\ y + \frac{1}{\sqrt{\alpha+\beta}}\Phi^{-1}(\frac{t}{D}) + \frac{(1-\lambda)\frac{\partial\theta^*}{\partial\lambda}}{1-(1-\lambda)\frac{\alpha}{\sqrt{\beta}}\frac{\partial\theta^*}{\partial\lambda}}, \\ y + \frac{\sqrt{\alpha+\gamma}}{\alpha}\Phi^{-1}(\frac{t}{D}) + \frac{\sqrt{\gamma}}{\alpha}\Phi^{-1}\Big(\Phi_1(\cdot) + \frac{\sqrt{\beta}}{(1-\lambda)\alpha} - \phi_1(\cdot) - \frac{\lambda}{1-\lambda}\sqrt{\frac{\beta}{\gamma}}\phi_2(\cdot)\Big), \\ y + \frac{\sqrt{\alpha+\gamma}}{\alpha}\Phi^{-1}(\frac{t}{D}) + \frac{\sqrt{\gamma}}{\alpha}\Phi^{-1}\Big(\Phi_1(\cdot) + \frac{\phi_1(\cdot)[\sqrt{\gamma}-(1-\lambda)\alpha\sqrt{\frac{\gamma}{\beta}}\phi_1(\cdot)]-\phi_2(\cdot)[\sqrt{\beta}-\lambda\alpha\sqrt{\frac{\beta}{\gamma}}\phi_2(\cdot)-\alpha\phi_1(\cdot)(1-2\lambda)]}{(1-\lambda)\alpha\sqrt{\frac{\gamma}{\beta}}\phi_1(\cdot)+\lambda\alpha\sqrt{\frac{\beta}{\gamma}}\phi_2(\cdot)}\Big) \end{cases}$$

Q.E.D.

Proof of corollary 3:

$$\frac{\partial\theta^*}{\partial\gamma} = \frac{\lambda\phi_2(\cdot)\left(-\frac{\alpha}{2\sqrt{\gamma^3}}\theta^* + \frac{\alpha}{2\sqrt{\gamma^3}}y + \frac{\alpha}{2\gamma^2}\sqrt{\frac{\gamma}{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D})\right)}{1-(1-\lambda)\phi_1(\cdot)\frac{\alpha}{\sqrt{\beta}} - \lambda\phi_2(\cdot)\frac{\alpha}{\sqrt{\gamma}}}$$

For values of θ^* above $y + \frac{1}{\sqrt{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D})$, this partial derivative is negative, so that the probability of a crisis decreases in the precision of the large trader's information. For $\theta^* < y + \frac{1}{\sqrt{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D})$, however, the partial derivative is positive and the opposite holds. The influence of λ on this partial derivative is given by

$$\begin{aligned} \frac{\partial^2\theta^*}{\partial\lambda\partial\gamma} = {} & \frac{\phi_2(\cdot)\left[\left(-\frac{\alpha}{2\sqrt{\gamma^3}}\theta^* + \frac{\alpha}{2\sqrt{\gamma^3}}y + \frac{\alpha}{2\gamma^2}\sqrt{\frac{\gamma}{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D})\right)\left(1+\lambda\frac{\alpha}{\sqrt{\gamma}}\frac{\partial\theta^*}{\partial\lambda}\right) - \lambda\frac{\alpha}{2\sqrt{\gamma^3}}\frac{\partial\theta^*}{\partial\lambda}\right]}{1-(1-\lambda)\phi_1(\cdot)\frac{\alpha}{\sqrt{\beta}} - \lambda\phi_2(\cdot)\frac{\alpha}{\sqrt{\gamma}}} \\ & -\lambda\phi_2(\cdot)\Big(-\frac{\alpha}{2\sqrt{\gamma^3}}\theta^* + \frac{\alpha}{2\sqrt{\gamma^3}}y + \frac{\alpha}{2\gamma^2}\sqrt{\frac{\gamma}{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D})\Big) \\ & \cdot\frac{\phi_1(\cdot)\frac{\alpha}{\sqrt{\beta}}(1-(1-\lambda)\frac{\alpha}{\sqrt{\beta}}\frac{\partial\theta^*}{\partial\lambda}) - \phi_2(\cdot)\frac{\alpha}{\sqrt{\gamma}}(1+\lambda\frac{\alpha}{\sqrt{\gamma}}\frac{\partial\theta^*}{\partial\lambda})}{[1-(1-\lambda)\phi_1(\cdot)\frac{\alpha}{\sqrt{\beta}} - \lambda\phi_2(\cdot)\frac{\alpha}{\sqrt{\gamma}}]^2} \end{aligned}$$

This cross partial derivative is negative for

$$\theta^* > \max \begin{cases} y + \frac{1}{\sqrt{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D}), \\ y + \frac{1}{\sqrt{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D}) - \frac{\lambda\frac{\partial\theta^*}{\partial\lambda}}{1+\lambda\frac{\alpha}{\sqrt{\gamma}}\frac{\partial\theta^*}{\partial\lambda}}, \\ y + \frac{\sqrt{\alpha+\gamma}}{\alpha}\Phi^{-1}(\frac{t}{D}) + \frac{\sqrt{\gamma}}{\alpha}\Phi^{-1}\Big(\Phi_1(\cdot) - \frac{\sqrt{\gamma}}{\lambda\alpha} + \frac{1-\lambda}{\lambda}\sqrt{\frac{\gamma}{\beta}}\phi_1(\cdot) + \phi_2(\cdot)\Big), \\ y + \frac{\sqrt{\alpha+\gamma}}{\alpha}\Phi^{-1}(\frac{t}{D}) + \frac{\sqrt{\gamma}}{\alpha}\Phi^{-1}\Big(\Phi_1(\cdot) + \frac{\phi_1(\cdot)[\sqrt{\gamma}-(1-\lambda)\alpha\sqrt{\frac{\gamma}{\beta}}\phi_1(\cdot)]-\phi_2(\cdot)[\sqrt{\beta}-\lambda\alpha\sqrt{\frac{\beta}{\gamma}}\phi_2(\cdot)-\alpha\phi_1(\cdot)(1-2\lambda)]}{(1-\lambda)\alpha\sqrt{\frac{\gamma}{\beta}}\phi_1(\cdot)+\lambda\alpha\sqrt{\frac{\beta}{\gamma}}\phi_2(\cdot)}\Big) \end{cases}$$

as well as for

$$\theta^* < \min \begin{cases} y + \frac{1}{\sqrt{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D}), \\ y + \frac{1}{\sqrt{\alpha+\gamma}}\Phi^{-1}(\frac{t}{D}) - \frac{\lambda\frac{\partial\theta^*}{\partial\lambda}}{1+\lambda\frac{\alpha}{\sqrt{\gamma}}\frac{\partial\theta^*}{\partial\lambda}}, \\ y + \frac{\sqrt{\alpha+\gamma}}{\alpha}\Phi^{-1}(\frac{t}{D}) + \frac{\sqrt{\gamma}}{\alpha}\Phi^{-1}\Big(\Phi_1(\cdot) - \frac{\sqrt{\gamma}}{\lambda\alpha} + \frac{1-\lambda}{\lambda}\sqrt{\frac{\gamma}{\beta}}\phi_1(\cdot) + \phi_2(\cdot)\Big), \\ y + \frac{\sqrt{\alpha+\gamma}}{\alpha}\Phi^{-1}(\frac{t}{D}) + \frac{\sqrt{\gamma}}{\alpha}\Phi^{-1}\Big(\Phi_1(\cdot) + \frac{\phi_1(\cdot)[\sqrt{\gamma}-(1-\lambda)\alpha\sqrt{\frac{\gamma}{\beta}}\phi_1(\cdot)]-\phi_2(\cdot)[\sqrt{\beta}-\lambda\alpha\sqrt{\frac{\beta}{\gamma}}\phi_2(\cdot)-\alpha\phi_1(\cdot)(1-2\lambda)]}{(1-\lambda)\alpha\sqrt{\frac{\gamma}{\beta}}\phi_1(\cdot)+\lambda\alpha\sqrt{\frac{\beta}{\gamma}}\phi_2(\cdot)}\Big) \end{cases}$$

Q.E.D.

Bisher erschienene Beiträge

28/02 **Metz**, Christina E.
Currency Crises – The Role of Large Traders
wird ersetzt durch Diskussionspapier 77/05

29/02 **Jerger**, Jürgen und Jochen **Michaelis**
Wage Hikes as Supply and Demand Shock
erschienen in: *Metroeconomica*, Vol. 54 (2003), S. 434-457.

30/02 **Großmann**, Harald
Sozialstandards in der Welthandelsordnung

31/02 **Heinemann**, Frank und Christina E. **Metz**
Optimal Risk Taking and Information Policy to Avoid Currency and Liquidity Crises
revidiert und wiedereingereicht bei: *European Economic Review*

32/02 **Michaelis**, Jochen
Optimal Monetary Policy in the Presence of Pricing-to-Market
wird ersetzt durch Diskussionspapier 68/05

33/02 **Eckey**, Hans-Friedrich
Die Entwicklung des Straßenverkehrs in Deutschland bis zum Jahr 2020 und ihre Auswirkung auf die Belegung des Straßennetzes in Nordhessen

34/02 **Lingens**, Jörg
Growth and Employment Effects of Unions in a Simple Endogenous Growth Model

35/02 **Michaelis**, Jochen und Michael P. **Pflüger**
Euroland: besser als befürchtet aber schlechter als erhofft?
erschienen in: *Vierteljahrshefte zur Wirtschaftsforschung*, Vol. 71 (2002), S. 296-311.

36/02 **Nutzinger**, Hans. G.
Effizienz, Gerechtigkeit und Nachhaltigkeit
erschienen in: Nutzinger, Hans G. (Hrsg.), *Regulierung, Wettbewerb und Marktwirtschaft - Festschrift für Carl Christian von Weizsäcker zum 65. Geburtstag*, Vandenhoeck & Ruprecht, Göttingen 2003.

37/02 **Birk**, Angela und Jochen **Michaelis**
Employment- and Growth Effects of Tax Reforms in a Growth-Matching Model

38/02 **Dreger**, Christian und Reinhold **Kosfeld**
Consumption and Income - Paneleconometric Evidence for West Germany
erschienen in: *Applied Economics Quarterly - Konjunkturpolitik*, Vol. 49 (2003), S. 75-88.

39/02 **Kosfeld**, Reinhold, Hans-Friedrich **Eckey** und Christian **Dreger**
Regional Convergence in Unified Germany: A Spatial Econometric Perspective
erscheint in: Dreger, C. und H.P. Galler (eds.), *Advances in macroeconometric modeling*, Papers and Proceedings of the 4th IWH Workshop in Macroeconometrics, Nomos, Baden-Baden.

40/02 **Feld**, Lars und Stefan **Voigt**
Economic Growth and Judicial Independence: Cross Country Evidence Using a New Set of Indicators
erschienen in: *European Journal of Political Economy*, Vol. 19 (2003), S. 497-527.

41/02 **Eckey**, Hans-Friedrich und Günter **Schumacher**
Divergenz und Konvergenz zwischen den Regionen Deutschlands

42/03 **Kosfeld**, Reinhold und Jorgen **Lauridsen**
Dynamic Spatial Modelling of Regional Convergence Processes
erschienen in: *Empirical Economics*, Vol 29 (2004), S. 705-722.

43/03 **Beckenbach**, Frank
Das Handlungskonzept der Evolutorischen Mikroökonomik

44/03 **Metz**, Christina E. und Jochen **Michaelis**
The Role of Information Disparity in the Mexican Peso Crisis 1994/95: Empirical Evidence

45/03 **Lingens**, Jörg
Unionisation, Growth and Endogenous Skill-Formation

46/03 **Hayo**, Bernd und Stefan **Voigt**
Explaining *de facto* judicial independence

47/03 **Beckenbach**, Frank und Maria **Daskalakis**
Invention and Innovation as Creative Problem Solving Activities - A Contribution to Evolutionary Microeconomics

48/03 **Weise**, Peter
Selbstorganisation - ein fruchtbares Konzept für die evolutorische Ökonomik?
erschienen in: W. Kerber (Hrsg.) (2004), Studien zur Evolutorischen Ökonomik IX, Berlin.

49/03 **Fromm**, Oliver; Maria **Daskalakis** und Oliver **Farhauer**
Das Reformprojekt Kostenmanagement im Sozialamt der Stadt Kassel - Die Investive Sozialhilfe der Stadt Kassel

50/03 **Eckey**, Hans-Friedrich, Reinhold **Kosfeld** und Matthias **Türck**
Intra- und internationale Spillover-Effekte zwischen den EU-Regionen

51/03 **Blume,** Lorenz
Factors of Successful Local Economic Policies: An Empirical Research of East German Cities

52/04 **Kosfeld**, Reinhold und Christian **Dreger**
Thresholds for Employment and Unemployment. A Spatial Analysis of German Regional Labour Markets 1992-2000
revidiert und wiedereingereicht bei: *Papers in Regional Science*

53/04 **Daskalakis**, Maria und Oliver **Fromm**
Entwicklungspotentiale der Region Nordhessen. Eine empirische Bestandsaufnahme.

54/04 **Grossmann**, Harald und Jochen **Michaelis**
Trade Sanctions and the Incidence of Child Labour
revidiert und wiedereingereicht bei: *Review of Development Economics*

55/04 **Eckey**, Hans-Friedrich und Reinhold **Kosfeld**
Regionaler Wirkungsgrad und räumliche Ausstrahlungseffekte der Investitionsförderung
erscheint in: *Jahrbuch für Regionalwissenschaft*

56/04 **Nill**, Jan
Evolutorisch-ökonomische Perspektiven einer Theorie ökologischer Innovationspolitik

57/04 **Kosfeld**, Reinhold und Jorgen **Lauridsen**
Factor Analysis Regression

58/04 **Michaelis**, Jochen und Angela **Birk**
Employment- and Growth Effects of Tax Reforms
revidiert und wiedereingereicht bei: *Economic Modelling*

59/04 **Nutzinger**, Hans G.
Die Wirtschaft in der Bibel
erscheint in: U. Ebert (Hrsg.), *Wirtschaftsethische Perspektiven VII*, Duncker & Humblot, Berlin, 2005 oder 2006

60/04 **Henrich**, Károly
Globale Einkommensdisparitäten und -polaritäten

61/04 **Michaelis**, Jochen und Alexander **Spermann**
Evaluation von Minijobs sowie Arbeitslosengeld II: Methodische Grundprobleme und Lösungsansätze
erschienen in: *Zeitschrift für Evaluation*, Heft 2 (2004), S. 223-240.

62/04 **Michaelis**, Jochen und Heike **Minich**
Inflationsdifferenzen im Euro-Raum – Eine Bestandsaufnahme
erschienen in: *Aussenwirtschaft*, 59. Jg., Heft 4 (2004), S. 379-405.

63/04 **Lerch**, Achim
Eine ökonomische Begründung der Nachhaltigkeit
erschienen in: Ekardt, F. (Hrsg.), *Generationengerechtigkeit und Zukunftsfähigkeit – Philosophische, juristische, ökonomische, politologische und theologische Konzepte für die Umwelt-, Sozial- und Wirtschaftspolitik*, Münster (LIT-Verlag), 2004.

64/04 **Eckey**, Hans-Friedrich, Reinhold **Kosfeld** und Matthias **Türck**
Regionale Produktionsfunktionen mit Spillover-Effekten für Deutschland
erscheint in: *Schmollers Jahrbuch 2/2005*

65/04 **Eckey**, Hans-Friedrich und Reinhold **Kosfeld**
New Economic Geography

66/04 **Blume**, Lorenz und Stefan **Voigt**
The Economic Effects of Human Rights

67/04 **Voigt**, Stefan, Michael **Ebeling** und Lorenz **Blume**
Improving Credibility by Delegating Judicial Competence –
the Case of the Judicial Committee of the Privy Council

68/05 **Michaelis**, Jochen
Optimal Monetary Policy in the Presence of Pricing-to-Market
erscheint in: *Journal of Macroeconomics*, Vol. 28 (2006), Heft 3.

69/05 **Eckey**, Hans-Friedrich und Matthias **Türck**
Deutsche Innovationsregionen

70/05 **Eckey**, Hans-Friedrich, Reinhold **Kosfeld** und Matthias **Türck**
Regionale Entwicklung mit und ohne räumliche Spillover Effekte

71/05 **Michaelis**, Jochen, Melanie **Arntz** und Alexander **Spermann**
Die Reform der Pflegeversicherung – weniger Kostendruck durch flexiblere Pflegearrangements?

72/05 **Voigt**, Stefan
The Economic Effects of Judicial Accountability - Some Preliminary Insights

73/05 **Voigt**, Stefan
Membership has its Privileges - On the Effects of Delegating Powers Internationally

74/05 **Michaelis**, Jochen
Zur Reform der Leistungsformen der Pflegeversicherung – ein familienökonomischer Ansatz

75/05 **Beckenbach**, Frank
Knowledge Representation and Search Processes - a Contribution to the Microeconomics of Invention and Innovation

76/05 **Eckey**, Hans-Friedrich, Reinhold **Kosfeld** und Matthias **Türck**
Regional Convergence in Germany. A Geographically Weighted Regression Approach

77/05 **Bannier**, Christina E.
Big Elephants in Small Ponds: Do Large Traders Make Financial Markets More Aggressive?
revidierte Fassung von Diskussionspapier 28/02
erscheint in: *Journal of Monetary Economics.*

Impressum
Volkswirtschaftliche Diskussionsbeiträge
Herausgeber:
Fachbereich Wirtschaftswissenschaften
Universität Kassel
Nora-Platiel-Str. 4
34127 Kassel
Internet: http://www.wirtschaft.uni-kassel.de
ISSN 1615-2751