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A General Financial Transaction Tax

Motives, Revenues, Feasibility and Effects

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0. Executive Summary

The issue of whether a tax should be levied on transactions of financial assets (FTT) has been controversial ever since it was proposed by *Keynes* (1936). The debate turns on the answers to three questions. First, is there excessive trading in financial markets which causes exchange rates, stock prices, and commodities prices to fluctuate excessively over the short run as well as over the long run? Second, would a small tax on financial transactions hamper destabilizing speculation without reducing liquidity beyond the level needed for market efficiency? Third, will the revenues of a general FTT even at a low tax rate be substantial relative to the costs of its implementation?

In order to answer these questions, the study first documents the development of trading volume and price dynamics in financial markets over the past decades. It's main observations are as follows:

- There is a remarkable discrepancy between the levels of financial transactions and the levels of the "underlying" transactions in the "real world". E.g., the volume of currency transactions is almost 70 times higher than trade of goods and services, transaction volume of interest rate securities is even several 100 times greater than overall investment.
- These discrepancies have risen tremendously since the late 1990s, i.e., financial transactions have expanded several times faster than transactions in the "underlying" markets for goods and services.
- Trading in derivatives markets has expanded significantly stronger than trading in spot markets. As a consequence, derivatives trading in Europe was already in 2006 84 times higher than nominal GDP, whereas spot trading was "only" 12 times higher.
- Asset prices like exchange rates, stock prices, or crude oil prices fluctuate in a sequence of medium-term upward and downward trends ("bull and bear markets"). These trends

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are the result of the accumulation of short-term (intraday) runs which persist in one direction longer than the counter-movements, i.e., in a "bullish" market upward runs persist longer than downward runs, the opposite is true in a "bearish" market.

These observations suggest that asset markets are characterized by excessive liquidity and excessive price volatility leading to large and persistent deviations from their fundamental equilibria. This pattern of asset price dynamics implies that the cumulative effects of increasingly short-term transactions are rather destabilizing than stabilizing. The growing importance of technical trading systems in financial markets contributes significantly to the volatility of asset prices over the short run as well as over the long run.

A general FTT would render transactions the more costly the shorter is their time horizon. Hence, it would tend to dampen technical trading, which is increasingly based on intraday price data. At the same time, technical trading strengthens price runs which in turn accumulate to medium-term trends that involve growing departures from long-run fundamental levels. As a consequence, a FTT would be expected to reduce excessive liquidity stemming from transactions which are very short-term oriented and that can be destabilizing at the same time.

The study estimates the potential revenues of a general FTT for three tax rates, namely, 0.1%, 0.05%, and 0.01%. The calculation assumes that the tax base is the notional value of the respective transaction. This design implies that the tax burden, relative to the cash invested to acquire a certain instrument, grows as transaction costs fall and the leverage effect rises. Such an FTT will hamper specifically those transactions that involve high leverage and, hence, a high risk (chance) of great losses (profits).

The revenue estimates are based on the assumption that transaction volumes will be reduced by the introduction of an FTT. The size of this reduction effect depends on the tax rate, the pre-tax transaction costs and the leverage in the case of derivatives instruments. For each tax rate and type of instrument, a low, medium and high "transactions-reduction-scenario" (TRS) is specified.

The potential revenues of a general FTT are estimated for selected European countries, as well as for major regions of the world and for the global economy as a whole. In Austria, e.g., overall receipts of an FTT with a rate of 0.1% would amount to 0.62% of GDP in the medium (TRS). If the tax rate were only 0.01%, tax receipts are estimated at 0.21% of GDP.

In Germany, FTT revenues in the case of the medium TRS would amount to 1.50%, 1.07%, and 0.47% of GDP for tax rates of 0.1%, 0.05% and 0.01%, respectively. Most of these revenues would stem from derivatives trading at EUREX. Tax revenues from spot transactions of stocks and bonds would be small (less than 0.1% of GDP even at a tax rate of 0.1%).

As regards the size of financial transactions relative to nominal GDP, the UK is a "special case". Hence, also revenues from an FTT would be exceptionally high. E.g., even in the case of the high TRS our calculations imply overall tax revenues of 2.49% of GDP at a (low) tax rate of 0.01%.

For the world economy as a whole, overall tax revenues would amount to 1.52% of world GDP at a tax rate of 0.1%, and 0.49% at a tax rate of 0.01%. In North America and Europe, tax

revenues would be similar in size, i.e., they should lie between 0.7% and 2.2% of GDP. In the Asian-pacific region, FTT revenues as a percent of GDP would be lower by roughly one third.

A general taxation of financial asset transactions in all major economies can only be the final stage in the process of implementing an FTT. The first stage could be the implementation of a tax levied only on spot and derivatives transactions on organized exchanges in some major EU economies. In fact, it would be sufficient if only the UK and Germany implemented such a tax (almost 99% of all spot and derivatives transactions on exchanges in the EU are carried out in these two countries).

This extreme concentration of transactions on exchanges in Europe (only 6% are spot transactions, 94% refer to futures and options) clearly shows that network externalities of well-established market places are the most important factor for their success. This in turn implies that an FTT of 0.05% or even only 0.01% will not induce any considerable "emigration" of transactions.

This presumption is confirmed by the success of the British "stamp duty" on stock transactions (as documented in this study). Even the comparatively high tax rate of 0.5% has obviously not done any harm to the attractiveness of the London stock exchange. At the same time, the revenues from the "stamp duty" are substantial, amounting to 0.7% of total tax receipts.

Based on the experience with an FTT levied only on transactions on organized exchanges one could include in the second stage all OTC transactions within the Euro area which involve no other currencies, i.e., primarily euro interest rate derivatives. The third stage would then include also spot and derivatives transactions in the foreign exchange market.

Due to network externalities, financial asset transactions are highly concentrated in certain markets. The same would be true for the potential revenues of an FTT. E.g., if an FTT would be implemented in "stage 1" on all transactions on exchanges in the EU27, almost all revenues would stem from transactions on the London and Frankfurt market places. However, the tax will effectively be paid by all actors who make use of the exchanges in London and Frankfurt. If one assumes that trading activities are roughly proportionate to the overall economic performance (i.e., nominal GDP) then an FTT might well be in line with the principle of a fair sharing of the tax burden. To put it differently: The fact that most of the tax revenues would be collected in the UK and Germany does not mean that only these countries carry the burden of the tax.

Of course, for providing such efficient market places as London and Frankfurt, the UK and Germany should get some fixed share of tax revenues (not the least also for political reasons). However, the other part of the revenues could be used to finance supranational projects at the EU level or at the global level.

1. Motivation, scope and structure of the study

Short-term speculation can push asset prices far away from values consistent with full employment. This was one of Keynes' key insights when dealing with the causes of the Great Depression. He argued in his "General Theory of Employment, Interest and Money" that policies aimed at limiting such instability would be beneficial. For the stock market Keynes proposed "The introduction of a substantial government transfer tax on all transactions [which] might prove the most serviceable reform available, with a view of mitigating the predominance of speculation over enterprises . . ." (*Keynes,* 1936, p. 160).

In the ensuing decades, this specific proposal of Keynes received little attention, paradoxically because – due to the influence of Keynes' writings – economic policy in general aimed at fostering the "predominance of enterprises over speculation". As a consequence, financial markets were highly regulated over the 1950s and 1960s, and this contributed to the relative stability of exchange rates, stock prices and commodities prices (as compared to the 1920s and 1930s, and even more relative to the period since the beginning of the 1980s). One important component of these regulations was the implementation of a variety of taxes on financial transactions (see section 3).

The idea of a financial transactions tax (FTT) attracted attention among policy makers after the break-down of the Bretton Woods system in the early 1970s. Once unglued from their pegs, exchange rates began, unexpectedly, to undergo wide swings away from historical benchmark levels such as purchasing power parity. This instability motivated James Tobin to propose "an internationally uniform tax on all spot conversions of one currency into another. . . . The tax would particularly deter short-term financial round-trip excursions into another currency." (*Tobin*, 1978, p. 155 – actually, Tobin had made this proposal, which figures as "Tobin tax" in the literature, already during the "stepwise" break-down of Bretton Woods, i.e., in 1972).

The past 30 years have witnessed a somewhat contradictory development of trading volume and price dynamics in financial markets on the one hand, and the use of transaction taxes in practice on the other. Financial innovations, in particular derivative instruments of all kinds, have contributed to a spectacular rise in turnover in all asset markets. Unsurprisingly, over this period, asset prices, including exchange rates, stock prices, and commodity prices (especially for crude oil) have undergone wide swings that have lasted several years. However, economic policy has not attempted to mitigate these price swings, e.g., by means of transaction taxes. In fact, many of these taxes have been abolished over the past 20 years.

One reason for the trend toward liberalization can be traced to the process of globalization, which has affected financial markets particularly strongly. Many transactions can now be easily relocated between different markets, causing competition to intensify also with respect to transaction taxes. This holds particularly true for small market places, whereas in a big financial centre like London, the government can still and successfully levy a comparatively high stamp duty on stock transactions (see section 3.4).

The globalization of financial markets has also made the potential implementation of a Tobin tax on foreign exchange transactions more difficult, albeit for political rather than for

technical reasons. This is because foreign exchange transactions can be easily transferred between market places in the same time zone. Consequently, the realization of a currency transaction tax necessitates a consensus of all countries with highly developed financial markets in a certain time zone.

The instability of financial markets together with their global interdependence and the related crises in the 1990s have re-ignited the debate over the pros and cons of a Tobin tax (important contributions in the early debate are collected in *Haq – Kaul – Grunberg,* 1996; for a survey including more recent studies see *Jetin – Denys*, 2005). The ensuing discussion led to new and more elaborate proposals on how to implement a Tobin tax in practice (*Spahn*, 2002; *Jetin – Denys*, 2005). In recent years, official political bodies in the EU like the national parliaments in Belgium, France and Austria also declared their support for such a tax if implemented in all EU member states.

The boom of financial transactions since the early 1980s and the observed price dynamics caused an increasing number of economists to doubt the validity of the equilibrium model of asset prices under rational expectations. The ensuing research efforts gave rise to a new branch in economics, the so-called "behavioral finance" (for an overview see *Shleifer*, 2000; *Shiller*, 2003). Over the past 25 years, this school has documented a great number of "anomalies" in financial markets, i.e., discrepancies between the observed behavior of actors and the assumptions under the equilibrium model. Among the most important deviations from the so-called "rational," utility-maximizing framework are psychological "biases" like overconfidence (*Daniel – Titman*, 2000), overreaction to news (*Lakonishok – Shleifer – Vishny*, 1994), changes in "expectational regimes" (*Barberis – Shleifer – Vishny*, 1998), the role of emotions and market moods (*Hirshleifer – Shumway*, 2003) and the related herding behavior (*Hirshleifer – Teoh*, 2003).

Many practitioners in financial markets attempt to exploit the phenomenon of "trending" of asset prices using "technical" models. These models try to identify trends using only the information contained in past prices ("the trend is your friend"). According to surveys conducted among currency traders, technical analysis has become the most important trading technique over short time horizons (*Menkhoff – Taylor*, 2007). The omnipresence of technical analysis in financial markets directly contradicts the rational expectations hypothesis (REH).

Another practice which has become increasingly popular in currency markets stands in sharp contradiction to the most fundamental assumption in conventional exchange rate theory, namely, the so-called carry trades. In a carry trade, one borrows funds in a currency with low interest rates and invests them in a high-interest currency expecting that the latter will appreciate. By contrast, it is assumed in standard theory that actors expect returns to be equalized across currencies through arbitrage ("uncovered interest parity").

The boom in trading volumes of all types in financial markets, the wide fluctuations of asset prices, as well as the growing discrepancy between the behavior of market participants on the one hand, and the assumptions made by conventional equilibrium theory on the other hand, motivated us to consider the pros and cons of a general and uniform FTT. Such a tax would be imposed on transactions of all kinds of financial assets, and, hence, would not be

restricted to specific markets like the original proposal by Keynes (stock market), the Tobin tax (foreign exchange market) or securities taxes implemented in the past (stamp duties, stock exchange transaction taxes). Financial transactions unrelated to asset prices like payments for goods or labor markets transactions or short-term borrowing/lending among banks are not subject to an FTT.

Conceptually, a general FTT seems "prima facie" more attractive than a specific transaction tax for at least three reasons. First, a general tax does not discriminate against specific types of markets, and it prevents tax avoidance by substituting taxed by untaxed transactions. Second, due to the enormous volume of the tax base the tax rate could be very small and yet, the tax receipts might be considerable. Third, such a tax could be implemented in a stepwise fashion so that (a group of) countries willing to impose it would start with domestic markets, which can be taxed at almost no administrative costs (e.g., it is easier to levy a rather miniscule tax of 0.01% on spot and derivatives transactions on organized exchanges as compared to transactions in a dealership market like the global foreign exchange market).

The main objectives of the chapters to follow are:

- Provide an overview over the theoretical pros and cons of a general and uniform FTT. Under which conditions in practice would such a tax improve or deteriorate the efficiency of modern asset markets?
- Summarize the experience with financial transaction taxes in the past. What effects of these taxes are reported in the empirical literature? Under which conditions did the taxation models prove successful, when had models to be abolished?
- Provide empirical evidence concerning the theoretical pros and cons of a general FTT. In particular, document the development of financial transactions by instruments, markets and regions/countries. Describe the fluctuations of important asset prices like exchange rates, stock prices and the crude oil price. Is the empirical evidence about trading and price dynamics consistent with market efficiency or with market failure?
- Estimate the potential revenues of a general FTT for three different tax rates using three different assumptions about the reduction in turnover due to the introduction of the tax. Differentiate these assumptions by instruments and markets. Provide the estimates for some European countries, for regions and for the world.
- Discuss issues related to the (stepwise) implementation of a general FTT as well as the probable economic effects of such a tax.

2. The debate over the usefulness and feasibility of financial transaction taxes

The proponents of financial transaction taxes (FTT) base their position on the various assertions about trading and price dynamics in asset markets and the effects of a transaction tax (*Keynes,* 1936; *Tobin*, 1978; *Stiglitz,* 1989; *Summers – Summers,* 1989; *Eichengreen – Tobin – Wyplosz,* 1995; *Arestis – Sawyer,* 1998; *Spahn,* 2002; *Pollin – Baker – Schaberg,* 2003; *Jetin – Denys*, 2005). These "pro-FTT-propositions" (PP) can be summarized as follows:

- PP1: There is excessive trading activity (= liquidity) in modern asset markets due to the predominance of short-term speculation ("In these markets . . . speculation on future prices is the dominating preoccupation of the participants" – *Tobin*, 1978, p. 157).
- PP2: Speculation is destabilizing, i.e., it moves prices often away from their fundamental equilibrium values ("In the absence of any consensus on fundamentals, the markets are dominated . . . by traders in the game of guessing what other traders are going to think." – *Tobin*, 1978, p. 158).
- PP3: The most pressing problem due to the predominance of short-term speculation is not so much the volatility of asset prices over the short run but over the medium and long run. This is so because short-term speculation causes long swings in asset prices and, hence, persistent deviations from their fundamental equilibria (Tobin identifies explicitly "large movements of exchange rates" as one consequence of currency speculation – *Tobin*, 1978, 154).
- PP4: The overshooting of exchange rates, but also of stock prices, interest rates and commodities prices fosters the "predominance of speculation over enterprise" (*Keynes*, 1936) and thereby dampens economic growth and employment.
- PP5: A uniform tax per transaction increases the costs of speculative trades the more the shorter their time horizon is. Hence, a transaction tax would have a stabilizing effect on asset prices and would thereby improve the overall macroeconomic performance.
- PP6: A (currency) transaction tax would provide governments and/or supranational organizations with considerable revenues which could/should be used for the achievement of policy goals, particularly on the supranational level (e.g., to finance global public goods like development aid or to strengthen the financial base of the EU). This revenue aspect played only a minor role in the original Tobin tax proposal, however, it got increasing attention in recent discussions (see *Landau report*, 2004; *Richter*, 2006, and *Jetin – Denys*, 2005)[1]).

The critics of an FTT base their position on a perception of trading and price dynamics in financial markets that is fundamentally different from the view of the proponents of such a tax (e.g., *ECB,* 2004; *Habermeier – Kirilenko*, 2003; *Grahl – Lysandrou*, 2003; one should add that conventional equilibrium economists, who represent the mainstream in financial economics, implicitly reject the idea of any FTT because it runs counter to their most fundamental assumptions like market efficiency and rational expectations). The counter-FTT-propositions (CP) can be summarized as follows:

- CP1: The high transaction volumes in modern financial markets stem mainly from the activities of market makers. The latter provide just the liquidity necessary for the price discovery process and, hence, for facilitating and smoothing the movements of asset prices towards their fundamental equilibria. Furthermore, "a large part (of short-term transactions) is related to hedging and distribution of risks" (*ECB*, 2004, p. 3).

[1]) An additional argument in favour of a general FTT concerns the exemption of financial services from the value-added-tax (VAT) and the related distortions (*Huizinga*, 2002). Thus a general FTT could serve as a substitute for the exemption of financial services from VAT (see also chapter 5.3).

- CP2: Speculation is an indispensable component of both, the price discovery process as well as the distribution of risks. As part of the former, speculation is essentially stabilizing, i.e., it moves asset prices smoothly and quickly to their equilibria (*Friedman*, 1953).
- CP3: Any increase in transaction costs, e.g. due to an FTT, will cause liquidity to decline which in turn will increase the short-term volatility of asset prices ("To the extent that the functioning of financial markets might be hampered by the tax, the risk-sharing benefits of deep and liquid markets might be reduced . . ." – *ECB,* 2004, p. 3).
- CP4: An endogenous overshooting caused by excessive speculation does not exist. Any deviation of asset prices from their fundamental equilibrium is due to exogenous shocks and, hence, is only a temporary phenomenon (within this perception of the world the persistent deviations of exchange rates from their fundamental equilibrium as well the slow speed at which exchange rates revert to PPP remains a puzzle: the so-called purchasing power parity puzzle – *Rogoff,* 1996; *Taylor – Taylor*, 2004).
- CP5: Transaction taxes are hard to implement, in particular taxes on international transactions. Moreover, "financial market participants are likely to find ways to circumvent the tax" (*ECB*, 2004, p. 3).

The pros and cons with respect to the usefulness off an FTT as summarized above are derived from two fundamentally different perceptions of the behavior of market participants, price dynamics, and market efficiency[2]). Hence, any evaluation of the validity of the different arguments has to answer the following question. Does the empirical evidence concerning transaction volumes, trading behavior, and price dynamics in financial markets fit into the picture drawn by the proponents of an FTT or does this evidence rather support the view of traditional (equilibrium) economics? For the sake of simplicity we term the "financial world" as perceived by FTT-opponents as "world I" and the perception of FFT-adherents as "world II".

Before stylizing the two different "financial worlds" we will discuss two terminological issues, i.e., the notion of liquidity and the notion of price volatility.

The argument of FTT-opponents that any increase in transaction costs will reduce market efficiency via a reduction of liquidity implies the following: there is a positive relationship between the number of transactions in an asset market (its liquidity) and the degree to which it is efficient. This statement is neither true for an ideal, frictionless market where all participants are equipped with perfect knowledge and where no transaction costs exist ("world 0"), nor for a market where actors process different information sets according to different economic models, and where decisions are also influenced by psychological factors like emotions as well as by their "bundling" to market moods ("world II").

In the first case of "world 0" there is no need for liquidity at all because prices would instantaneously jump to their new equilibrium in reaction to new information without any transaction taking place (*Habermeier – Kirilenko*, 2003, sketch this world when dealing with financial transaction taxes). Hence, in "world 0," transactions would only be necessary as the

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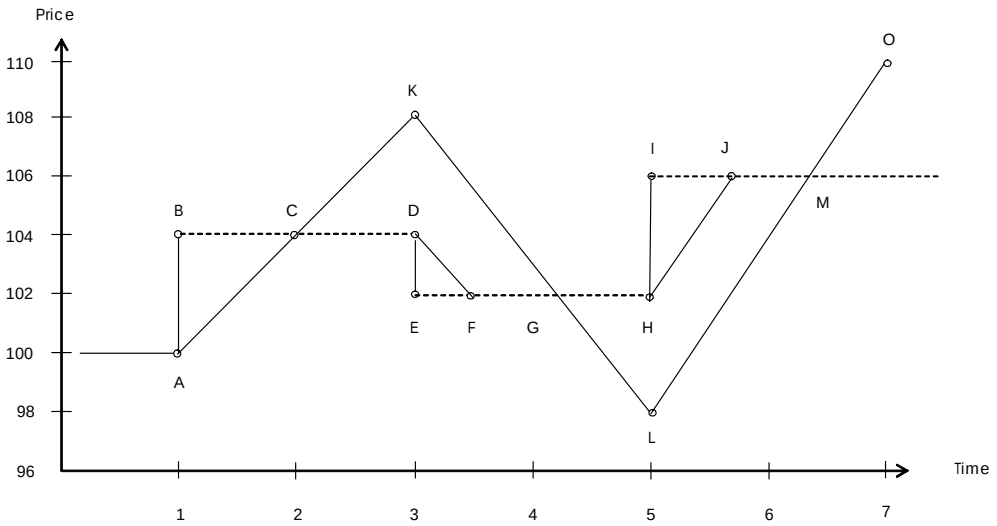
[2]) Recently, a paper by *Stadler – Pock* (2006) takes a position beyond this sharp dichotomy between pros and cons. The authors propose a "Tobin Tax light" of just 0.01% on currency transactions. Such a tax would affect foreign exchange markets only marginally, yet would deliver substantial revenues.

monetary/financial counterpart of "real world" transactions. E.g., turnover in the foreign exchange market would be the sum of exports and imports, turnover in the stock and bond market would be restricted to financing investments through the issue of stocks or bonds (as *Modigliani – Miller*, 1958, have shown the difference between equity and debt financing does not matter in this world).

In "world II", transactions of "bounded-rational" or even irrational traders who drive the price beyond its theoretical fundamental equilibrium, necessarily weaken asset market efficiency. Hence, "world I" represents just a special case. In this "world" all actors are fully rational and use the same information set and the same "true" model, but do not know the expectations of other participants (*Haberer*, 2004). For that reason and also because transactions are costly (*Habermeier – Kirilenko,* 2003) prices cannot jump instantaneously to a new equilibrium but follow a gradual path through a series of transactions. Hence, liquidity and consequently low transaction costs enhance this process of price discovery[3]).

Figure 1: Three stylized paths of asset prices



A simple chart stylizes the three paths of asset prices (figure 1). In "world 0" new information at the point in time = 1 causes the asset price to jump instantaneously from the old equilibrium at P = 100 (at point A) to the new equilibrium at P = 104 (B). The price stays there until news in t = 3 cause the price to jump to P = 102 (E). Finally in t = 5 new information once again causes an instantaneous price adjustment to P = 106 (I).

In "world I" prices adjust only gradually, i.e., it takes a series of transactions (and one time period) to move the price from P = 100 to P = 104, i.e., from A to C. However, since there are

[3]) The consequences of relaxing the assumption of perfect knowledge for modelling economic theories have not yet been fully considered in the literature. In a recent, pathbreaking book, *Frydma - Goldberg* (2007) demonstrate that recognizing the importance of imperfect knowledge is key to understanding outcomes in financial markets and that the difficulties encountered by neoclassical theory and behavioral finance models to explain financial market behaviour stem from their disregard of this insight. However, for the purpose of this study, we stick to the (over)simplified stylized models of "world I" and "world II" which reflect the (over)simplifications of conventional asset pricing models.

only rational traders in this world, the price movement will stop at the new fundamental equlibrium level and stay there until t = 3 (then the price starts to move from D to F). According to the opponents of an FTT, high liquidity and, hence, frequent transactions will foster the adjustment processes from A to C, D to F or H to J. By contrast, higher transaction costs due to an FTT will cause prices to become more volatile during the adjustment processes. In addition, an FTT will also lengthen the transition period between any two equilibria.

In "world II" there exist traders who form their price expectations according to the most recent movements, i.e., when prices move persistently up (down) they expect the respective trend to continue. Hence, they buy (sell) when prices are rising (falling), which in turn strengthens the trend. Others might behave so for emotional reasons (rising prices make them more optimistic, falling prices more pessimistic). Again other actors behave in a similar way because they like to follow the crowd (herding). In addition, there might be traders who try to guess the transactions of other traders by interpreting the mood in the market ("bullishness/bearishness"). In "world II", all these effects will lengthen the price adjustment process beyond the new equilibrium level and, hence, cause prices to overshoot.

As a consequence of the "trending" of asset prices, rational investors (in the sense of profit-seeking) will try to systematically exploit this non-randomness in price dynamics. Over more than 100 years people have developed and used a great variety of "technical" trading systems. All models of "technical analysis" have in common that they attempt to exploit price trends and by doing so they reinforce the pattern of asset price dynamics as a sequence of upward and downward trends (for a comprehensive treatment of technical analysis see *Kaufman*, 1987; the interaction between technical trading and price dynamics is explored in *Schulmeister*, 2006, 2007A). One class of models "rides" the trend and thereby strengthens it at the same time ("trend-following systems"), the other class of models bets on a reversal of the trend and thereby contributes to such a reversal ("contrarian models").

In our stylized example those transactions (in "world II) which cause the price to overshoot (driving it from C to K, from G to L and from M to O) have to be considered "excessive" (as in "world I" price movements are triggered by news also in "world II"). These overshooting price changes amount to 12 between t = 1 and t = 7. The overall price changes over this period amount to 30 (8 + 10 + 12), whereas only cumulative price changes of 10 (4 + 2 + 4) would be fundamentally justified (for which a "basic" liquidity is necessary in "world I"). This stylized example shows that once prices start to overshoot, their overall price path becomes much longer and the related transaction volumes get much bigger than under purely rational expectations (as in "world I"). E.g., even though one could interpret the price movement from K to G as "stabilizing", two third of this movement are just necessary to correct the preceding overshooting.

As a consequence, any evaluation of the usefulness of an FTT has to gauge the importance of excessive trading and excessive price movements stemming from destabilizing speculators in today's financial markets (relative to the "basic" liquidity necessary to smoothly move prices from one fundamental equilibrium to the next one). Theoretical models which allow for the interaction of heterogeneous actors (in particular "fundamentalists" and "technical speculators") arrive at the conclusion that there exists an optimal level of liquidity and a

respective optimal tax rate which minimizes asset price volatility (*Westerhoff*, 2003; *Haberer*, 2004)[4]).

As for the concept of volatility, there are at least three different meanings of this notion, which are often not made explicit and are mixed up:

- The first meaning concerns the statistical variance of asset returns, hence, this notion of volatility is unrelated to market fundamentals. It is usually calculated as standard deviation of returns on the basis of daily or even intraday price data (see the literature summarized in section 3.3). We shall call this type of volatility "statistical short-term volatility".
- The second meaning concerns the variance of asset returns relative to the variance of their fundamentals. This type of volatility is investigated by means of "variance bounds tests" (e.g., *Shiller*, 1989; *LeRoy*, 1989). We call this " fundamental short-term volatility".
- The third meaning concerns the long swings of asset prices around their fundamental equilibrium, i.e., the phenomenon of medium-term overshooting. Since these fluctuations represent irregular cycles, one can hardly measure this "medium-term volatility related to fundamentals" as the statistical variance of price changes based on very low frequency data (like annual data) but rather as (absolute) deviations of prices from their fundamental equilibrium (e.g., as deviation of the nominal exchange rate from PPP).

Two important problems are related to the different notions of price volatility. First, when discussing the possible effects of an FTT on volatility, the proponents and opponents of such a tax have different meanings of volatility in mind. The opponents are concerned about the statistical short-term volatility which might rise due to the introduction of an FTT and the related reduction of liquidity (*ECB,* 2004; *Habermeier – Kirilenko,* 2003). The proponents, by contrast, argue that an FTT would reduce the long-term overshooting of speculative prices (e.g., *Tobin*, 1978; *Eichengreen – Tobin – Wyplosz,* 1995). Second, this "communication problem" is aggravated by the fact that short-term statistical volatility and the long-term misalignment of asset prices are conceptually independent from each other (the importance of the difference between the two volatility concepts is correctly stressed by *Wahl*, 2005).

To illustrate this difference by two "stylized" examples: suppose an asset price lies initially at its fundamental equilibrium level and then starts to rise by 0.1% day after day. In this case the short-term variance of returns is zero, yet the price moves away from its equilibrium along a bubble path. By contrast, if the price fluctuates from day to day widely around its equilibrium, e.g., within a range of ±3% per day, then its short-term volatility is high, yet no long-term misalignment occurs.

Unfortunately, all empirical studies on the relationship between transaction costs, trading volume and price volatility in general, and on the possible effects of an FTT on volatility in particular, deal with short-term statistical volatility only. Therefore, the results of these studies cannot help to answer the question whether or not an FTT will mitigate misalignments of asset prices over the medium and long run.

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[4]) *Song – Zhang* (2005) develop a theoretical model in which an FTT can either increase or decrease asset price volatility, depending on market conditions.

Table 1: Features of three hypothetical "worlds" of financial markets

	World 0	**World I**	**World II**
General characteristic	Perfect knowledge and foresight. Rational expectations. No transaction costs (frictionless markets).	As in world 0 with two exeptions: – Transaction costs matter – Expectations of other actors due to news have to be discovered in a gradual adjustment process.	Imperfect knowledge as general condition of social interaction: Actors process different information sets using different models. Actors are human beings: Expectations and transactions are governed by rational, emotional und social factors.
Expectations	Homogeneous.	In general homogeneous, but heterogeneous during the price discovery/adjustment process.	Heterogeneous.
Expectations formation	Quantitative.	Quantitative.	Often only directional (qualitative).
Price adjustment to news	Instantaneous jumps to the new fundamental equilibrium.	Gradual price movement towards the new fundamental equilibrium.	Price movement overshoots the "region" of) the new fundamental equilibrium. Short-term trending of asset prices accumulates to medium-term trends due to optimistic or pessimistic biases in expectations ("bullishness/bearishness").
Transaction volume	Low (counterpart of the "underlying" transaction in goods markets).	"Basic" liquidity necessary for the price discovery process => Trading volume higher than the "underlying" goods markets transactions, moving in tandem with the latter over time.	"Excessive" trading causes transaction volumes to grow significantly faster than the "underlying" transactions in goods markets.
Statistical short-term price volatility	High due to price jumps.	Uncertain.	Uncertain.
Short-term volatility related to fundamentals	Zero.	Low.	High.
Long-term volatility related to fundamentals	Zero.	Zero.	High.
Trading is based on	Fundamentals.	Fundamentals.	Fundamentals, technical models as well as on psychological factors on the individual level (e.g. emotions) as well as on the social level (e.g. market moods, herding).

There is a second important shortcoming of the empirical volatility studies: they do not distinguish between "basic" liquidity and "excessive" liquidity (and the related "excessive" price volatility). This shortcoming might have contributed to the contradictory and, hence, inconclusive results of these studies (some find a negative relationship between trading volume and volatility, others a negative or no significant relationship – see section 3.3.1).

Finally, one should note that if one takes into account the fact that economic actors will continuously try to discover profit opportunities, then the conditions of "world II" will almost inevitably emanate from those of "world I". This is so for the following reason. If prices move

smoothly from one fundamental equilibrium to the next, and if this process takes some time due to learning the expectations of other actors as well as due to transaction costs, then profit-seeking actors will attempt to exploit the related persistence of price movements. The use of trend-following trading strategies will in turn increase the momentum of price movements which will then hardly stop exactly at the new fundamental equilibrium (for theoretical as well as computational models dealing with the interaction of heterogeneous actors see *DeLong et al*., 1990A and 1990B; *Frenkel – Froot*, 1990; *De Grauwe – Grimaldi*, 2006; *Hommes*, 2006; *Frydman – Goldberg*, 2007; this issue is investigated in the context of transaction taxes by *Kupiec*, 1996; *Westerhoff*, 2003; *Haberer*, 2004; *Song – Zhang*, 2005).

Table 1 summarizes the main features of the three different "worlds" of financial markets ("world 0" is also covered since – though unrealistic – it serves as benchmark model in asset pricing theory). This overview should help us answering the following question: which empirical observations concerning trading volume and price volatility would (rather) confirm the "world-I-picture" of financial markets, which would (rather) fit into the "world-II-picture"?

As basis for an evaluation of the usefulness of an FTT we shall first present an overview over the past experience with transaction taxes (section 3) and we will then compare the empirical evidence about transaction volumes and asset price dynamics to the expectations under the conditions of "world I" and of "world II" (section 4).

3. Hitherto existing taxation of financial transactions

To get an idea of how a tax on financial asset transactions could be implemented and what (intended and non-intended) effects the taxation of financial transactions might trigger, it is worth while looking at international experiences with such taxes. Up to date, taxes on financial transactions have been limited to certain sub-markets: namely the issuance of securities and shares increasing firms' equity and debt (capital duty and securities tax), as well as the trade with these financial instruments (transaction or transfer taxes). Currency transactions, while having drawn particular attention by academics as well as policy-makers for more than three decades now (see also section 1), have remained untaxed up to now. Existing taxes on financial transactions are exclusively levied on the national level, hence their proceeds are exclusively used to finance national budgets. Therefore, a review and analysis of experiences with existing taxes on financial transactions can only refer to those sub-markets on which financial transactions are subject to taxation already, and to taxes on financial transactions imposed on a national level.

The review of international experiences undertaken in this section of the study starts with a systematic overview over taxes levied on financial transactions in various sub-markets on a national level. This overview includes the 27 member states of the European Union and Switzerland as another important European financial centre as well as several other financial centers of world-wide importance (the United States, Japan, Hong Kong, South Korea, Singapore, Australia, and Taiwan). It concentrates on the two types of capital transaction taxes most wide-spread in the group of countries reviewed: capital duty on the contribution of capital to firms and transfer tax on the transfer of financial instruments. Also, tax rates and the most important tax exemptions as well as revenues in 2005 (in absolute terms and as

percentage of GDP) are included. If applicable, the year of abolishment of formerly levied capital transaction taxes as well as the applied tax rates are included for those countries for which the relevant information is available. In addition to capital duties and transfer taxes, a number of countries levy various other duties and fees on capital transactions; which, however, are too variegated to be included in a concise and not-too-complex overview.

In the next sub-section we present a survey of empirical studies on the relationship between transaction costs, financial taxes (as part of the former), price volatility and trading volume in financial markets.

The section concludes with two case studies which examine the (intended and non-intended) effects of the taxes on financial transactions levied in the United Kingdom and Sweden. This analysis serves as a basis to draw some conclusions for the design of financial transactions taxes in general.

3.1 Recent general developments

In principle, capital transaction or transfer taxes can be levied on different sub-markets and on various kinds of financial transactions, respectively: for example on currency transactions or on the emission or the trade of various financial instruments (shares, securities, etc.). In practice, mainly two kinds of capital transaction taxes can be found: taxes on the contribution of capital (equity) to companies (capital duty[5]); and (stock exchange) turnover (transfer) taxes[6]), which are levied on the trade with financial instruments. Up to now, currency transaction taxes do not exist anywhere.

Due to various reasons, the number of countries imposing a tax on financial transactions is in decline (*Pollin – Baker – Schaberg*, 2001). Change of political power (and thus a change of taxation objectives), fear of losing competitiveness compared to other financial centers against the background of increasing international capital mobility, efforts to foster the development of local stock exchanges, and too much distortion combined with too little revenue (presumably) raised by such taxes may be some of the motivations playing a role in abolishing them. While it is difficult to determine the relative importance of each factor mentioned above, it is obvious that an appropriate design of a tax on financial transactions as well as the economic environment and institutional framework are decisive for the effects it generates. Thus it would be too short-sighted to conclude that the decreasing group of countries levying a financial transactions tax represents sufficient evidence for the economic arguments brought forward against this type of taxes.

Particularly the past two decades witnessed the elimination of taxes on financial transactions in quite a number of countries (see table A1 in the annex)[7]): for example, the United States (turnover tax on the federal level, 1966), Spain (1988), the Netherlands (transfer tax 1990, capital duty 2006), Germany (securities tax[8]) 1965, stock exchange turnover tax 1991, capital

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[5]) In German: Gesellschaftssteuer. Capital duty is an indirect tax levied on contributions of capital for incorporated companies and restructuring operations involving capital companies.

[6]) In German: Börsenumsatzsteuer.

[7]) See also *Pollin - Baker – Schaberg* (2001).

[8]) In German: Wertpapiersteuer.

duty 1992), Sweden (transfer tax 1991, capital duty 1995), Denmark (capital duty 1993, transfer tax 1999) and Japan (1999) as well as Austria (securities tax 1995, stock exchange turnover tax 2000) and most recently Italy (capital duty 2000), Ireland (2005) and Belgium (2006). In other countries the quantitative weight and the scope of the tax have been reduced by the introduction of extensive exemptions. By now only seven countries (Austria, Cyprus, Greece, Luxembourg, Poland, Portugal and Spain) out of 27 EU member countries still impose capital duties. Ten EU-27 countries (Belgium, Finland, France, Greece, Ireland, Italy, United Kingdom, Cyprus, Malta and Poland) levy a stock exchange transaction tax.

Within the EU, legislation and European Court of Justice (ECJ) judicature have contributed significantly to the long-term loss in significance of financial transaction taxes. Directive 69/335/EEC of 17 July 1969 concerning indirect taxes on the raising of capital regulates and harmonizes the taxation of the raising of capital in the EU member countries. It prohibits levying a similar tax other than a capital duty. Since the last change of this Directive in 1985, member states are allowed to impose a capital duty at a maximum rate of 1%. Furthermore, the Directive prohibits the taxation of the issuance of shares, stocks or other securities with securities taxes (Article 11), in order to strengthen the common market and to promote the integration of European capital markets. In December 2006 the European Commission launched a proposal to phase out capital duty across member states gradually, by limiting it in a first step to 0.5% in 2008 and then abolishing it completely by 2010 (*European Commission*, 2006).

Also of relevance is a recent judgement of the ECJ in 2004 stating that part of the Belgian tax on stock exchange transactions violated Directive 69/335/EEC[9]). Since taxation in Belgium applied not only to transactions of existing securities but to their initial emission too, the ECJ ruled that this form of taxation does not conform to Directive 69/335/EEC and has to be brought in line with Article 11. Therefore Belgium has abolished its capital duty in 2006 (see table A1 in the annex).

Belgium has nevertheless underlined its commitment to a tax on financial transactions as the Belgian parliament passed a bill in July 2004, which states that Belgium intends to levy a currency transaction tax if all other members of the Eurozone would be willing to do so as well. France took this step already in November 2001, in the aftermath of the financial crises shortly before. But also France is willing to implement this tax only within a common move of all EU member countries. A more careful approach has been taken by Austria, which announced to foster talks and promote the process of implementing a currency transaction on the EU level. The latest initiative in this direction came from the European Parliament in February 2006, which formulated a joint motion for a resolution to levy an FTT (*European Parliament*, 2006).

[9]) See Amtsblatt der Europäischen Union C 228/7, September 11, 2004.

3.2 Overview of existing capital transaction taxes

Table A1 in the annex shows the main elements of taxes on financial transactions in Switzerland and in those EU member states which still make use of this kind of tax[10]). Moreover, several other important financial centers outside of Europe are included: the US, Japan, South Corea, Hong Kong, Singapore, Australia, and Taiwan.

Table A1 categorizes the existing financial transaction taxes according to the principal tax design into capital duties and transfer taxes. Capital duties in principle date back to stamp duties, which originate from the tradition of taxing the registration of legal documents of all kinds, some of them concerning property rights. Without paying these fees, legal ownership could not be established. Nowadays stamp duties on the registration of documents have been abolished in many countries, but the basic method of taxing the registration of property rights is still being used for taxes on the emission of equity or debt. The alternative type is a transfer tax in the traditional sense – taxing the transaction of property rights itself, not their registration.

In practice this means that a tax of the stamp duty type can tax stock and securities relating to domestically incorporated entities virtually worldwide, whereas a transfer tax can be imposed on all kinds of transactions traded within that particular jurisdiction. This fundamental difference is decisive for the size of the tax base as well as for the possibilities of tax evasion, as the examples of Sweden and the United Kingdom reviewed below will show. However, the difference between the two types is not always that clear-cut. The taxation of stock transactions was in some cases a deliberate aim, for which a new tax was created (e.g. France, Sweden). In other countries it was first merely a by-product of another tax. In the UK, for example, stamp duty is not only levied on stocks, but also on transactions involving land property. Another example is Poland, where the taxation of stock transactions is part of a more broadly defined transfer tax.

In the group of countries reviewed, seven, 7 out of 27 EU member states as well as Switzerland and Japan currently have a capital duty with a tax rate of up to 1% (which is the upper limit in the EU). A transfer tax can be found in ten countries of the EU-27, in Switzerland and in Hong Kong, China, Taiwan and Singapore. The maximum transfer tax rate in this country group is 5%, the median lies at 0.8%. Austria, which has abolished its stock exchange turnover tax in 2000, levies a capital duty of 1% only. Germany does not have any financial transaction taxes any more. Within the EU, it is striking that only four out of 15 old member countries, but nine out of 12 new member countries do not impose any tax on financial transactions.

Revenues from financial taxes generally make a rather modest contribution to the financing of public budgets: in relative terms they are most important in Greece and the United Kingdom, where the revenues from financial transaction taxes reach 0.8% of GDP in 2005.

Outside of Europe, financial transaction taxes – and particular transfer taxes – exist in some other major financial centers as Singapore and Hong Kong as well as in countries with

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[10]) Table 1 is based on information obtained from the International Bureau of Fiscal Documentation (IBFD). The IBFD database represents the most comprehensive source available on financial transfer taxes, still the quality of description and detail of information on exemptions and taxable transactions differs between countries and is often rather limited.

emerging stock exchanges as China[11]) and India and in most South-East-Asian countries (*Song – Zhang*, 2005). Even though there is no tax on stock exchange transactions in the USA on the federal level, a number of states impose initial registration and/or annual capital taxes on corporations based on share capital or the number of shares issued (capital duty) or taxes on the transfer of corporate stock (transfer tax). The state of New York currently levies a stamp duty on transactions on the two largest stock exchanges in the world (measured by market capitalization as well as by volume of share volume), the NYSE and the NASDAQ. The concept of this tax is similar to the UK stamp duty, but the tax rate is merely 0.003%, which is planned to be gradually decreased in the next years (*Richter*, 2006). Since it is a tax on the state level, only companies incorporated in New York are subject to taxation, whereas firms from abroad or even from other US states are exempted. Hence this tax cannot pose a threat to the overall volume of turnover on the NYSE.

The existing significant cross-country differences make the comparison of financial transaction taxes across countries a difficult task. Nonetheless, some common tendencies can be observed (*Wrobel*, 1996). Many countries do not tax financial intermediaries, as these market-makers play a crucial role for the liquidity and hence the functioning of the market. Government securities are usually exempt, so that the government's ability to raise capital is not harmed. Generally, financial transaction taxes are not levied on financial transactions carried out by private households (bank withdrawals, cheque writing, consumer credits). Finally, transactions outside national boundaries in many cases are not taxed, due to enforcement problems.

3.3 Financial transaction taxes, price volatility and trading activities

In the last two decades, a substantial body of empirical literature has developed trying to elaborate the economic effects of financial transaction taxes and, hence, to provide empirical evidence concerning the theoretical pros and cons of such taxes addressed above (see section 2). Two potential effects are particularly in the focus: the impact of financial transaction taxes on price volatility as well as their effect on trading volumes.

3.3.1 Transaction taxes, transaction costs and trading volumes

As discussed in section 2 the potential impact of financial transaction taxes on volatility is one of the most debated questions in the theoretical literature. The proponents of such taxes advocate their implementation as an important means to reduce primarily the long-term volatility of asset prices, i.e., the tendency of asset prices to overshoot their fundamental equilibrium. By contrast, the opponents of transaction taxes fear that the related rise in transaction costs will reduce trading volume and market liquidity, which in turn will increase price volatility. It is clear from this argument that the opponents of an FTT are concerned

[11]) During the 17 years of their existence, stock exchange transfer taxes have been undergoing frequent and significant changes in China. First introduced at the Shenzhen Stock Exchange in 1990, at a rate of 0.6% for sellers (little later also for buyers), in 1991 the rate of the tax was halved and a transfer tax was implemented also at the Shanghai Stock Exchange. In 1997, the tax rate was raised to 0.5% and lowered again to 0.4% in 1998, to 0.3% in 1999, to 0.2% in 2001 and to 0.1% in 2005. Only recently (in May 2007) the tax rate was tripled again.

about short-term price volatility whereas the adherents believe that an FTT will reduce long-term misalignments of asset prices.

Table 2: Effects of financial transaction taxes or transaction costs in general on short-term price volatility

Author(s)	**Market**	**(Implicit) Relationship**
Wang – Yau (2000)	United States	Positive
Lindgren (1994)	United States	Positive
Jones – Seguin (1997)	United States	Positive
Green – Maggioni – Murinde (2000)	United Kingdom	Positive
Aitken – Swan (2000)	Australia	Positive
Hau (2006)	France	Positive
Domowitz – Glen – Madhavan (2000)	42 countries	Positive (except for transition countries)
Swan – Westerholm (2001)	Finland, Sweden	Positive
Aliber – Chowdhry – Yan (2003)	United States	Positive
Baltagi – Li – Li (2006)	China	Positive
Umlauf (1993)	Sweden	None
Hu (1998)	Hong Kong, Japan, Korea, Taiwan	None
Roll (1989)	23 markets	None
Saporta – Kan (1997)	United Kingdom	None
Chou – Wang (2006)	Taiwan	None
French – Roll (1986)	United States	Negative (via trading volume)
Bessembinder – Seguin (1993)	United States	Negative (via trading volume)
Jones – Kaul – Lipson (1994)	United States	Negative (via trading frequency)
Hau (2001)	France	negative
Huang – Cai – Wang (2002)	United States	Negative (via trading frequency)
Sarwar (2003)	United States	Negative (via trading volume)

Note: "Via trading volume (frequency)" means that the respective study finds a positive relationship between trading volume (or trading frequency) and price volatility. This finding implies a negative relationship between transaction costs (and a transaction tax as part of them) and volatility (higher transaction costs will "ceteris paribus" always dampen trading activities).

Unfortunately, this problem in the theoretical debate over the usefulness of an FTT is not mitigated by the extant studies on the relationship between transaction costs, trading activities and price volatility. This is so because all these studies focus on short-term price volatility only as measured by the variance of returns based on daily or even on intraday data.

Table 2 provides an overview over selected empirical studies examining the relationship between transaction costs or financial transaction taxes (as one element of transaction costs) and short-term price volatility.

The overview shows that the results of these studies are contradictory and, hence, inconclusive. Ten studies report a positive relationship between transaction taxes and short-term price volatility, five studies did not find any significant relationship. Finally, six studies show (implicitly) that higher transaction costs might dampen price volatility. This is so because these studies report that a reduction of trading activities is associated with lower price volatility. This finding implies a negative relationship between transaction costs and volatility since higher transaction costs will "ceteris paribus" always dampen trading activities.

There might be many reasons for why these studies are that inconclusive. These reasons range from the lack of appropriate data to the more essential problem of neglecting the difference between "basic" price volatility associated with "basic" liquidity (i.e., trading by "fundamentals-oriented" actors) on the one hand, and "excessive" volatility associated with "excessive" liquidity (i.e., trading by "non-fundamentalists" like technical speculators, etc.) on the other hand (this issue is discussed in section 2).

Habermeier – Kirilenko (2003) summarize the caveats concerning studies on the relationship between transactions costs in general and transaction taxes in particular, trading activities and price volatility as follows: "First, the effects of taxes on prices and volume are hard to disentangle from other structural and policy changes taking place at the same time. Therefore, estimates based on the assumption that everything else in the economy is held constant are potentially biased. Second, it is difficult to separate transaction volume into stable (or "fundamental") and destabilizing (or "noise") components. Thus, it is hard to say which part of the volume is more affected by the tax. Third, it is hard to differentiate between multiple ways in which transaction taxes can affect asset prices. These ways include changes in expectations about the impact of the taxes, the cost of creating and trading in close substitutes not covered by the tax, and changes in market liquidity."

In addition to the generally inconclusive results of the empirical studies on the relationship between transaction costs and asset price volatility, the following observation calls in question particularly the assertion that this relationship will be positive: over the past 20 years transaction costs in stock markets have substantially declined (as in financial markets in general), however, the volatility of stock prices – at least in the US – has exhibited a clear upward trend at the same time (*Campbell et al.*, 2001).

Finally, we would like to add that even if these studies were more conclusive they would not contribute to a clarification of the crucial issue whether or not an FTT will dampen the long-term overshooting of asset prices, as they concentrate on short-term volatility only.

3.3.2 Financial transaction taxes and trading volumes

The existing empirical literature on the impact of transaction taxes (and more generally of transaction costs) on trading volumes altogether points at rather large elasticities, ranging from –0.25[12]) to –1.65 (table 3)[13]). Accordingly, a 1% increase in transaction costs would dampen turnover by 0.25% to 1.65%. *Kiefer* (1990) estimates for the US that the introduction of a broad-based securities transaction tax of 0.5% might decrease trading volume by 8%. For China, *Baltagi – Li – Li* (2006) find that an increase of the Chinese stamp tax rate by 0.2 percentage points reduces trading volume by one third.

Moreover, there are interrelations between transaction costs, trading volumes on the 3domestic markets affected by the tax and trading volumes migrating from domestic to foreign markets, as *Campbell – Froot* (1994) demonstrate empirically for 20 countries.

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[12]) *Schwert – Seguin* (1993) suggest that this estimate – which stems from Epps (1976) – is too low.

[13]) The finding by *Hu* (1998), who analyzes the impact of 14 tax changes in four Asian markets, that there is no significant effect on trading volumes, appears as an exception in the empirical literature.

Table 3: Financial transaction tax (Transaction cost) elasticities

Author(s)	Market	Transaction Tax (Cost) Elasticity
Epps (1976)	United States	–0.25
Jackson – O'Donnell (1985)	United Kingdom	–1.65
Lindgren – Westlund (1990)	Sweden	–0.85 to –1.35
Ericsson – Lindgren (1992)	23 stock markets	–1.2 to –1.5
Aitken – Swan (2000)	Australia	–0.97 to –1.2
Swan – Westerholm (2001)	Sweden, Finland	–1.0, –1.27
Zhang (2001)	Shanghai, Shenzhen (China)	–0.58, –0.49

It should be taken into account that these results must be interpreted with caution, due to measurement and methodological problems. Moreover, the transaction tax (cost) elasticities derived in these studies may not be directly comparable and cannot be transferred directly to any kind of financial transaction tax, as the relevant transaction taxes differ in their respective designs (*Hawkins – McCrae*, 2002). It is also important to note that the studies included in this survey mostly refer to traditional spot markets where transaction costs are much higher than in derivatives markets. Hence, a uniform and general transaction tax will cause transaction costs to rise much stronger in derivatives markets as compared to spot markets (with the exception of the foreign exchange market). As a consequence, any uniform FTT will dampen derivatives trading to a much greater extent than spot trading (this effect would enhance market efficiency if destabilizing speculation was concentrated on trading derivative instruments). However, this effect would be mitigated if the FTT covered all instruments and the most important market places (at least within the same time zone) as in this case there would be no or only little options for substitution by switching to alternative, non-taxed financial instruments or financial centers.

To sum up, the existing analyses suggest that turnover on financial markets is rather sensitive to variations of transaction costs. Although we will need to set own assumptions about the reduction of trading volume in response to the introduction of a uniform FTT we can safely assume that the impact of the tax on trading volumes is of a rather large magnitude, in particular on trading derivatives.

3.4 Two case studies – Sweden and the United Kingdom

In this section two short case studies are presented: the Swedish experience with a securities transaction tax, which was a failure; and the successful application of a stamp duty in the United Kingdom.

3.4.1 The securities transaction tax in Sweden

Securities transaction tax (STT) legislation was effective in Sweden from 1984 to 1991. The tax is widely considered a failure by the financial literature. This chapter of the study traces the evolution of the Swedish STT and attempts to identify the reasons for its disappointing performance.

In January 1984, Sweden introduced a tax of 0.5% on the purchase and sale of equities, adding up to 1% per round trip. This tax was levied directly on registered Swedish brokerage services, which were needed to conduct exchanges of meaningful size. Both domestic and

foreign customers had to pay the tax when using Swedish brokerage. If no dealer was needed, no tax was levied (e.g., gifts or inheritances of stock were tax free, as well as private trades consisting of small, infrequent exchanges). Two foreign parties conducting an exchange with a Swedish broker were only subject to the tax when a security registered in Sweden was involved. Trades between market makers (the brokers) were not subject to taxation until 1987, as they were initially considered intermediate, not final consumption of domestic brokerage services.

Additionally, a tax on stock options of 2% per round trip was introduced (1% on the option premium plus 1% for the exercise of the option since it was treated like a transaction in the underlying stock). Naturally, any introduction or increase of a tax will lead investors to devaluate their assets accordingly to account for the present value of the future tax payments. In the Swedish case, the introduction of the tax led to an index fall of 2.2% on the same day. The index return in the 30-day-period including the announcement and the introduction of the tax was estimated at –5.3%. In July 1986, the tax rate on equity transactions was doubled to 2% per round trip[14]). However, this event caused an index fall of 0.8% only (*Umlauf*, 1993, p. 230ff). From early 1987 on, inter-dealer equity trades, which were until then considered intermediate consumption and thus not liable to the tax, were taxed at 1% per round trip.

Tax revenues, though growing during the period 1984-1989 (see table 4), were considered disappointing in levels. The major reason for the budgetary failure of the tax is tax avoidance (see below). In addition, secondary effects on other taxes, e.g. capital gains tax, arising from the introduction of the securities transaction tax had a negative impact on public revenues.

The last three columns of table 4 provide evidence that share trading of large companies was moving abroad while the tax was levied[15]). Data are only available from 1988 on. Swedish shares were then traded in Stockholm, London and New York. The vast majority of trading was conducted in the former two markets for liquidity reasons, since New York is in a different time zone. *Umlauf* (1993) reports a migration of the unrestricted, most actively traded share classes to London shortly before the doubling of the tax rate in 1986. Over time, it became more and more attractive for both foreign and local investors to go abroad. For foreign investors, it was easy to use non-Swedish brokers for their transactions to avoid the tax[16]). Domestic investors on the other hand "tended to substitute (...) more toward not trading at all" instead of trading abroad (*Campbell – Froot* 1993, p. 7). This may be explained by the fact that tax avoidance costs for Swedish investors were higher: an offshore company had to be set up in order to avoid the use of Swedish brokerage services and an exit tax of three times the round trip equity tax was charged on funds moved abroad.

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[14]) For the political reasons that led to this tax increase and to the introduction of the tax in general as well as for the experiences of Sweden with securities transactions taxes in history, see in general *Waldenström* (2002) and *Lyböck* (1991) especially for the devastating tax on fixed-income securities.

[15]) During that time, Swedish shares had different share classes, where in one share class one usually had the majority of votes and was restricted to Swedish owners, while another one was unrestricted (allowed for foreign ownership) and most liquid. The unrestricted share class grants no voting rights, but an equal claim on the cash flow of the company.

[16]) See also the evidence presented in *Campbell – Froot* (1993, p. 7f) with the corresponding Figures 2, 3a and 3b.

Table 4: Swedish transaction tax revenues and trading migration

	Revenues of Turnover Tax on Securities	Revenues of Turnover Tax on Securities	Transaction tax rate	Annual Swedish Trading volume	Trading of Swedish stocks inside Sweden	Trading of Swedish unrestricted shares inside Sweden
	In % of GDP	In % of total tax revenues	On equity traded, per round-trip	Executed in London	Average of 19 large Swedish companies	
1984	0.10	0.21	1%	NA	NA	NA
1985	0.13	0.27	1%	NA	NA	NA
1986	0.26	0.53	1%, 2%	NA	NA	NA
1987	0.35	0.66	2%	30% [1])	NA	NA
1988	0.34	0.66	2%	48%	61%	47%
1989	0.45	0.85	2%	51%	57%	42%
1990	0.43	0.81	2%	52%	56%	42%
1991	0.25	0.50	1%	NA [2])	52%	40%
1992	0.02	0.04	0%	NA	56%	50%

The revenue data are for the total of all turnover taxes on securities, while the transaction tax rate represented in column three only applies to the major tax on equity (there were different tax rates for other instruments). – [1]) For 1987, there is an estimate only by the Stockholm Stock Exchange. – [2]) In December 1991, all taxes were abolished.

Following large losses in interest-rate futures and options by the City of Stockholm and an insurance company, a turnover tax on fixed-income securities, which complemented the tax on equities, took effect on January 1, 1989. Fixed-income securities (including government debt) and associated derivatives such as interest-rate futures and options were covered by the tax with a varying rate, no larger than 0.15% of the underlying notional or cash amount[17]). Lower than expected revenues and concerns that taxes in the money market merely raised the costs of government borrowing eventually led to the abolition of the fixed-income securities taxes on April 1, 1990.

Using data on Swedish government bonds and bills, *Campbell – Froot* (1993, p. 8ff) show that the tax on fixed-income securities had a much larger impact on trading in their respective markets than the equity securities tax. After strong reactions in the first week with the tax in place[18]), the spot market in bills and bonds retained roughly 60% of its trading volume in the time period up to the removal of the tax. While the futures market for bonds recovered slowly, the one for bills did not[19]).

[17]) Bonds were taxed according to their maturity. Per round trip, bonds with a maturity of 90 days, one year and three years were taxed at 0.002%, 0.01% and 0.03%, respectively.

[18]) Trading volume in bonds, futures on bonds and bills, and options declined by 85%, 98% and 100% respectively, see *Campbell – Froot* (1993, p. 8f).

[19]) See *Campbell – Froot* (1993), Figure 4 and 5. The reason for non-recovery may also have been the availability of a substitute.

What had caused the greater reduction in volumes in the fixed-income markets compared to the equities market? In contrast to what had happened in the markets for equity transactions, trading did not move abroad. Instead, the strong reactions of the fixed-income volume can be attributed to "the relative ease with which substitutes for bonds can be created" (*Campbell – Froot,* 1993, p. 9). Tax avoidance turned out to be easy and loopholes manifold: the markets for instruments not subject to the tax (debentures, forward rate agreements, swaps) or exchanged without a dealer (variable-rate agreements) grew rapidly. As a result, the turnover tax on fixed-income securities raised little revenue: on average, only SEK 50 million per year instead of the projected SEK 1,500 million were realized. As *Campbell – Froot* (1993, p. 10) note, had there not been even cheaper alternatives in the local market and presumably less foreign investors engaged in Swedish fixed-income securities trading, offshore migration might have occurred since there were no barriers to trading SEK-denominated instruments in foreign markets.

In the beginning of 1991, tax rates on all remaining transaction taxes were cut by one half and on December 1, 1991, all remaining security transaction taxes in Sweden were eventually abolished.

For the most part, the Swedish STT experience may be considered a failure[20]). With the Swedish experience in mind, why can there still be a case for a STT?

When a new transaction tax is introduced, the cost of each transaction is increased[21]), which may cause tax avoidance behavior on the part of the (rational) investor. Whether (and how much) tax avoidance occurs is determined by the availability (and costs) of avoidance measures. Furthermore, an investor always has the possibility not to trade at all.

Thus, in responding to an introduction of a STT, investors may adapt their behavior in the following ways:

- Continue trading and pay the tax.
- Change the location of the trade (spatial substitution, necessarily in the same or an adjacent time zone).
- Trade substitute securities (preferably untaxed securities; availability issues).
- Choose not to trade.

In general, an investor will pick the option that is least harmful to his profits. If no substitutes (options 2 and 3) exist, an investor will choose option 1 if he continues to make profits (or derive a positive expected utility) through trading despite the higher transactions costs. Otherwise, he will choose option 4 and not trade at all.

Both options 2 and 3 are substitute options. A rational investor will choose a substitute only if his expected profit of trading the substitute is positive and greater than his expected profit of

[20]) With respect to the revenue that had been projected initially, it may also be called a disaster.

[21]) These costs would typically consist of what the bank/dealer charges the customer in order to conduct the transaction. More precisely, transaction costs may influenced by various parameters; to state *Hawkins – McCrae* (2002, p. 27): "Components of the transaction cost of buying a share include brokers' fees, market impact costs (the effect of a transaction on the market price if the market is illiquid), opportunity costs (of financial intermediaries who temporarily invest their own capital in the shares) and the bid-ask spread, which typically increases by the amount of any transaction tax."

trading in the taxed security. This is equal to saying that the costs of using the substitute[22]) need to be less than the costs of simply paying the tax or not trading at all.

For option 2 (changing the location of the trade, spatial substitution) to really be an option, an appropriate substitute market is required. In the case of the Swedish equity transaction tax, the London Stock Exchange proved to be such a market especially for foreign investors. However, the costs of spatial substitution most likely will be prohibitive if the only available substitute market is in a different (or at least non-adjacent) time zone[23]).

Option 3 depends on the availability of substitute securities. For some securities covered by the Swedish fixed-income securities tax, untaxed domestic substitutes were available so that investors could easily conduct their transactions in these without incurring large additional costs.

In the end, the Swedish turnover tax failed due to a bad tax design and the resulting migration of trading volume. Having learned the lesson from the Swedish experience, one should make sure a FTT covers all markets to a priori minimize material substitution problems[24]). The tax should possibly be applied to all countries of the respective time zone with a market for securities, since this will prevent spatial substitution. If it is not feasible to include all countries, special higher exit taxes, intelligent tax design, political pressure on tax havens or bilateral contracts over the treatment of securities may also be steps that can be taken. Helpful in this respect is also the British lesson (see the following section): tax liability for trading in UK companies is worldwide, whereas in Sweden one only had to pay when the transaction was carried out by a Swedish broker, which made tax avoidance relatively easy.

3.4.2 The stamp duty in the United Kingdom

The securities transaction tax levied in the United Kingdom is called "stamp duty." The name originates from the "tax on the transfer of a [financial instrument] from one owner to another, which could only be made legally effective by an official stamp applied to the [instrument]" (*Campbell – Froot*, 1995, p. 11). Stamp duty is thus a tax on the registration of ownership of a financial asset. Practically, this means that for any purchase of shares of UK companies a tax rate of 0.5% is levied on the purchase price. Thus, the purchaser has to pay the tax. Only when new stock is issued, the issuer pays the tax. The current tax rate applies since 1986, when the "stamp duty reserve tax" (SDRT) was introduced to properly levy stamp duty on the London Stock Exchange by taxing not only documents of transfer, but also agreements to do so. Until then, it was possible to avoid stamp duty by buying and reselling a stock between ownership registration dates every two weeks on the London Stock Exchange (see *Campbell – Froot,* 1995, p. 11, footnote 16). Also, tax avoidance was restricted through the introduction of a special higher tax rate in 1986 (see below). Basically, SDRT applies on all agreements to

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[22]) Among other possible costs, this includes the transaction costs of the substitute and the costs incurred because the substitute may not be a perfect one.

[23]) Although some Swedish shares were also traded in New York, it is unlikely that the main trading volume would have migrated to New York in the absence of a trading place like London.

[24]) If new untaxed substitutes are created, e.g. depository receipts as a substitute to trading in British shares, the tax administration and the government should be prepared to react as flexible as the British government did in 1986 when they introduced an exit tax on depository receipts and similar substitutes.

transfer (followed by an automatic levy on the stock exchange), while any transfer where a formal document is produced falls under "ordinary" stamp duty. Nowadays, most of the revenues come from SDRT.

Stamp duty applies to transactions of ordinary shares and assets convertible to shares. Futures and options are not subject to taxation, but the exercise of an option is treated as a purchase of shares and is therefore taxed at the exercise price. Transactions of fixed-income securities like the purchase of corporate and government bonds are not liable for taxation. A few exemptions from stamp duty exist; among them are market-makers when they trade in the securities for which they make the market.

Unlike the Swedish STT, the British stamp duty is not a tax on the domestic consumption of trading services. Instead, stamp duty is a worldwide tax on ownership transfer of companies incorporated in the United Kingdom, independently of where the transaction takes place and whether the trader is foreign or domestic. This implies that securities of foreign incorporated companies issued or listed on the London Stock Exchange are not subject to the tax. Over time, stamp duty rates have been altered quite a few times. As mentioned above, since 1986 the regular rate is 0.5%, with a special "exit charge" of 1.5%. The latter applies when shares are transferred to clearance services and/or converted to financial products that effectively avoid stamp duty.

A common way to do so is by issuing depository receipts. Usually, a (US-American) bank takes the part of the nominee shareholder that buys shares and exercises voting rights, but then issues "depository receipts" to market participants; a contract which entitles them to the cash flow (dividends) that the ordinary shareholder (the bank) receives. Depository receipts may then be traded free of stamp duty since no change in ownership occurs.

Stamp duty yields are a function of share prices, share quantity and turnover and thus reflect the development of the stock market. Stamp duty revenue growth was much higher than that of other taxes in the stock market boom years from 1997 to 2001 and stagnated from 2002 to 2004. Surpassing its previous high in 2001, stamp duty revenue in the fiscal year 2005/06 stood at £ 3.46 billion (approximately € 5 billion), which amounted to 0.7% of total tax revenues. Costs of collection are extremely low for stamp duty. *Hawkins – McCrae* (2002), presenting evidence from Inland Revenue, state that while the average cost of collection of all taxes collected by Inland Revenue is 1.11 pence per pound collected, it is only 0.02 pence per pound for SDRT since it is automatically levied with the transactions system of the London Stock Exchange. It is reasonable to expect that any other form of STT or FTT levied on the basis of electronic transaction systems would involve similarly low costs of collection.

Possible longer-term threats to the stamp duty tax base include "trading derivatives rather than underlying shares", "share transactions moving offshore" and "overseas reincorporation of UK companies". The latter is unlikely as it would require setting up a foreign headquarter of a company and convincing Inland Revenue that effective control and management has moved abroad. Trading in derivatives has been rather irrelevant for three reasons. First, pensions and life assurance funds, holding approximately 40% of UK equities by value, face additional costs when moving to derivatives since they are not classified as admissible for solvency tests the Financial Services Authority conducts in the UK. Second, markets for

derivatives like depository receipts are small and illiquid compared with the market for ordinary shares, and thus not appropriate for major institutional investors. Third, the tax authorities can in principle broaden the tax base to all derivatives emerging as major threat to the tax base just as it was done with depository receipts in 1986.

The last threat, i.e., share transaction moving offshore, is in theory impossible to become a problem since stamp duty also applies to overseas transactions of UK shares. In practice, however, it is unclear whether current legislation and international/bilateral agreements would be sufficient to collect stamp duty if UK companies were listed on foreign stock markets. However, there are a couple of other steps UK tax authorities could take, such as charging "interest on the stamp duty due on share transactions that take place overseas, which becomes payable with the original charge when the relevant legal documents are returned to the UK" or "levying an exit-charge on initial public offerings on overseas stock markets" (*Hawkins – McCrae*, 2002, p. 18).

Comparing the British with the Swedish experience, it becomes clear that the importance of the tax design cannot be overrated. As the levying of stamp duty is independent of the location of the trade and the investor, large substitution effects do not arise. However, due to its specific design for the UK and the only limited coverage of financial instruments, a UK-style stamp duty is unlikely to be an appropriate financial transaction tax providing reasonable revenues for larger areas like Europe. There are also a number of potential adverse effects from stamp duty that need to be taken into account. Nevertheless, what can be learned from the British experience is that a STT can work well if legislators are willing to ensure that financial innovations or other tax avoidance measures threatening the tax base are included into the tax base or charged with a higher rate upon leaving the tax regime.

4. Trading volume and price dynamics in financial markets

In this section we document at first the development of financial transactions by markets and instruments and compare their levels to the levels of the "underlying" transactions in the "real world" (e.g., spot and derivatives transactions in the foreign exchange markets in relation to international trade of goods and services). We also show how these relationships have developed over time. Then we sketch the long-term fluctuations of exchange rates, stock prices and crude oil prices around their fundamental equilibrium. Finally, we provide evidence how extremely short-term price movements accumulate to medium-term and long-term trends and how the sequence of these "bull markets" and "bear markets" bring about price cycles (we take the cycle of the dollar/euro exchange rate between 1999 and 2005 as an example).

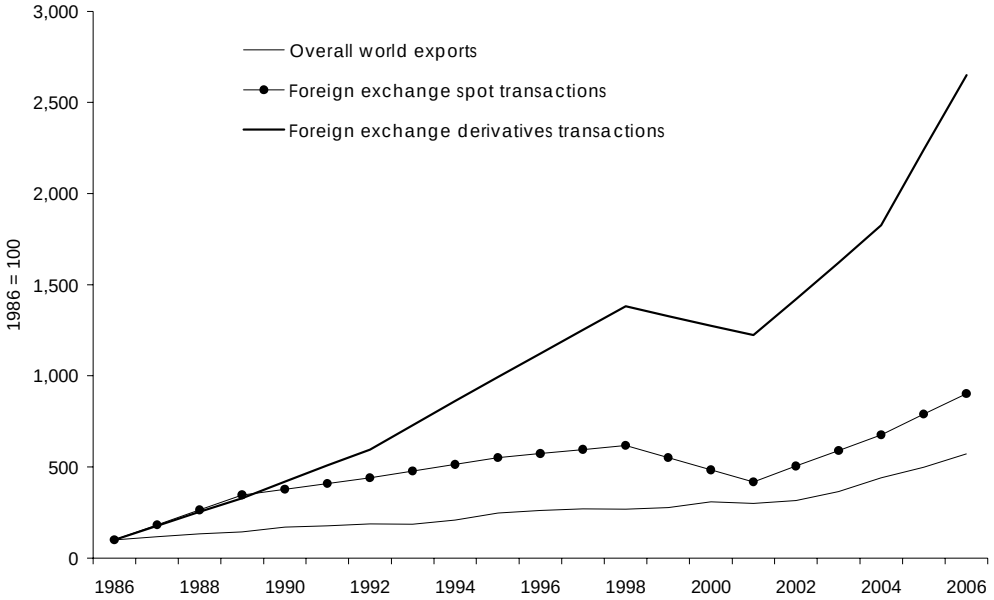
The main purpose of this exercise is to collect different elements of the overall "puzzle" of the dynamics of transactions and prices in modern asset markets. When putting all these elements together the emerging picture will certainly not be comprehensive, yet, it might be sufficiently clear to answer the crucial question: do trading behavior and price dynamics in asset markets rather fit into the "world I-picture" (where predominantly rational traders drive prices from one fundamental equilibrium to the next) or into the "world II-picture" (where the interaction of "fundamentalists" and "non-fundamentalists" cause prices to overshoot over the

short as well as over the medium run)? And if the observations are rather in line with the assumptions implied by the "world II-picture", is there some empirical evidence that a general und uniform FTT will dampen "excessive" liquidity and the related overshooting of asset prices to a larger extent than "basic" liquidity needed to move prices efficiently between changing fundamental equilibria?

4.1 Financial transactions and the "underlying" activities in the markets for goods and services

Figure 2 compares the dynamics of global transactions in the foreign exchange markets to the development of overall world trade in goods and services. Between 1986 and 2006 overall world trade has expanded by 471.2% to an index level of 571.2 (9.1% per year). Over the same period spot transactions in the foreign exchange market rose somewhat faster (by 803% or 11.6% per year, respectively)[25]). In comparison to spot transactions, derivatives trading almost exploded, mostly carried out over the counter (OTC). Between 1986 and 2006 the transaction volume of currency derivatives has increased by 2,551% (17.8% per year). Since the dollar is the most traded currency worldwide the long-term swing of its exchange rates affects transactions volumes when expressed in dollars (valuation/conversion effect). However, this is certainly not the most important reason for the extremely strong expansion of trading currency derivatives since 2001 (figure 2).

Figure 2: World trade and foreign exchange transactions



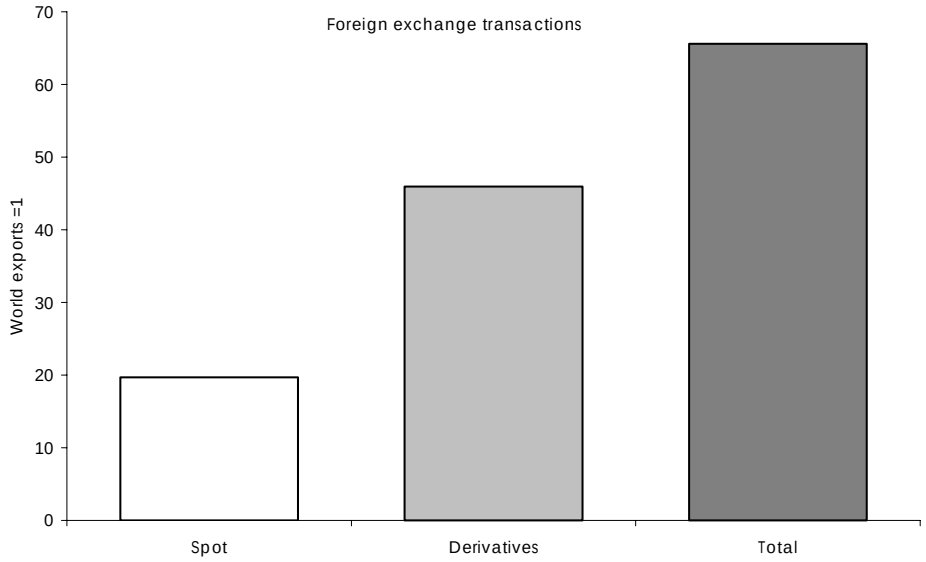
Source: BIS, WFE, OECD, Oxford Economic Forecasting (OEF).

Figure 3 shows that in 2006 the level of overall foreign exchange trading was roughly 66 times higher than total world trade of goods and services. Due to the much higher expansion of

[25]) Throughout this study, financial transactions as well as "real world" transactions are measured in dollar terms at current prices and exchange rates. All data issues are discussed more in detail in section 5.2.1.

transactions of currency derivatives the volume of the latter is more than twice as large as the volume of spot transactions.

Figure 3: Volume of overall trade and foreign exchange transactions in 2006



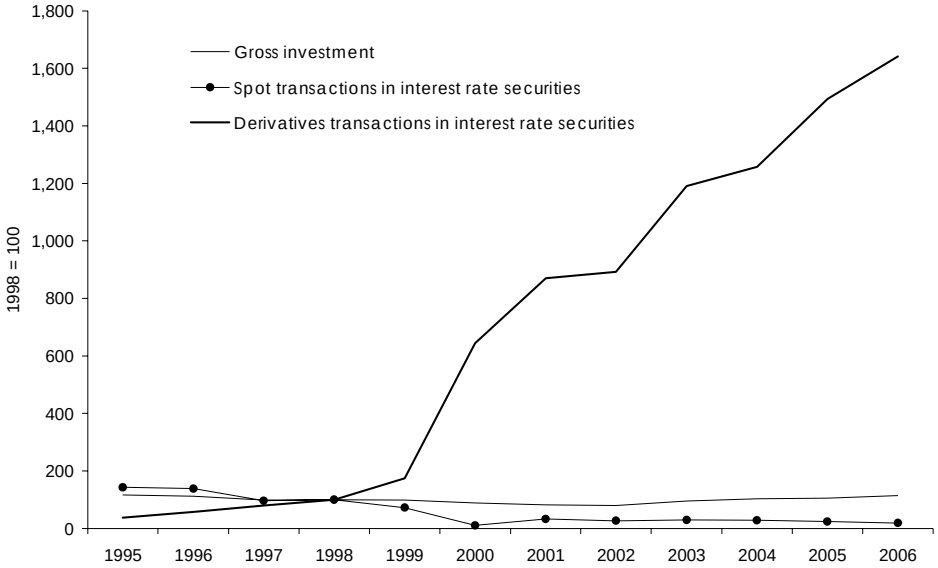
Source: BIS, WFE, OECD, OEF.

When evaluating the expansion of trading volumes in the foreign exchange market one has to consider that a customer order often induces a series of currency transactions in the interbank market (mostly for reasons of risk diversification – for this "hot potato story" see *Lyons*, 1997, 1998, 2001). However, even if one takes this "multiplier effect" into account, it seems implausible that the volume of foreign exchange trading is mainly driven by orders stemming from "underlying" transactions in the markets for goods, services and long-term capital as well as from the related demand for hedging.

There are three reasons for this presumption. First, there is no convincing explanation why the "hot potato multiplier" should rise strongly over time. Second, the chain of trades triggered by a "real world" transaction is not only caused by risk diversifying transactions of market makers, but is in many (if not most) cases also influenced by speculative considerations. E.g., if a trader incurs a long dollar position due to the execution of a customer order he will almost always check if he rather expects the dollar to rise or fall over the next following seconds or minutes. If he expects an appreciation of the dollar he won't close the position at once. Third, the importance of this speculation motive is strengthened if traders interpret customer orders as containing private information about imminent exchange rate changes (*Lyons*, 2001).

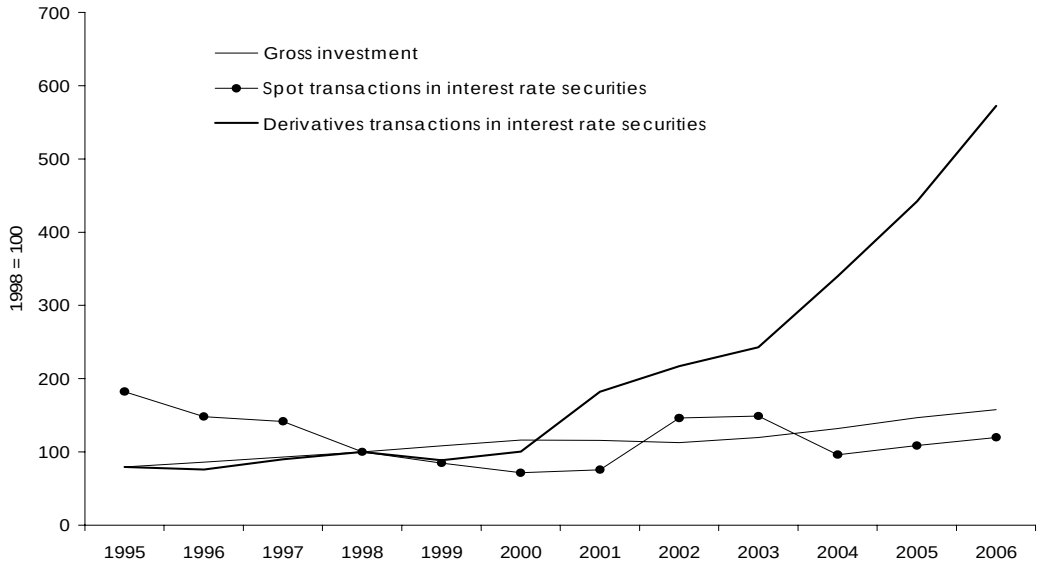
Figures 4 and 5 compare the development and the level of transactions of interest rate securities to the level of overall gross investment (investment expenditures are taken as – admittedly very rough – proxies for the "underlying" goods markets transactions under the conditions of an ideal market with perfect knowledge, rational expectations and no transaction costs – the case of "world 0").

Figure 4a: Gross investment and transactions of interest rate securities in Germany



Source: BIS, WFE, Deutsche Börse/EUREX, OECD.

Figure 4b: Gross investment and transactions of interest rate securities in North America

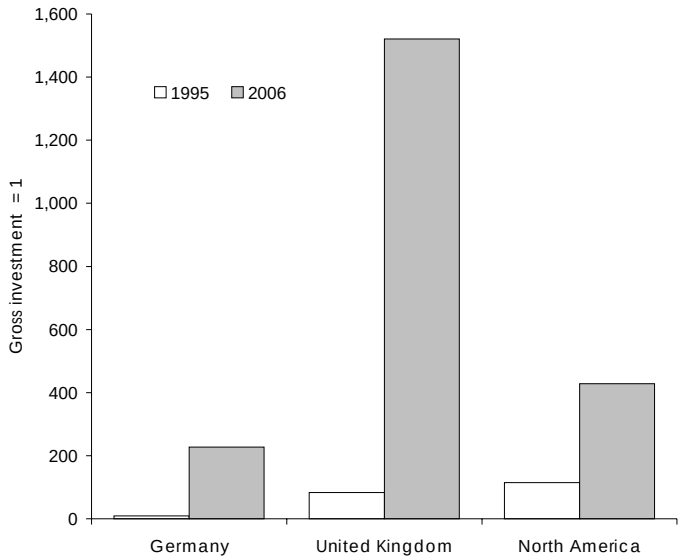


Source: BIS, WFE, OECD.

As in the case of foreign exchange, trading of interest rate securities expanded much faster in the derivatives markets as compared to the spot markets. In Germany the transaction volume of interest rate derivatives rose by 41.9% per year and in North America by 24.4% per year between 1998 and 2006 (figures 4a and 4b). At the same time spot transactions have declined (their level is very small; the fact that our data base does not include OTC traded T-bills and bonds do not matter quantitatively).

Due to the spectacular growth of trading in interest rate derivatives, in 2006 the level of overall transactions of interest rate securities was in Germany roughly 230 times higher than total expenditures on gross investments, in North America this ratio amounted to roughly 430 and in the UK to 1,520 (figure 5). The rise of this ratio was particularly impressive in Germany, where in 1995 the trading volume of interest securities was "only" nine times higher than investment expenditures.

Figure 5: Volume of gross investment and transactions of interest rate securities

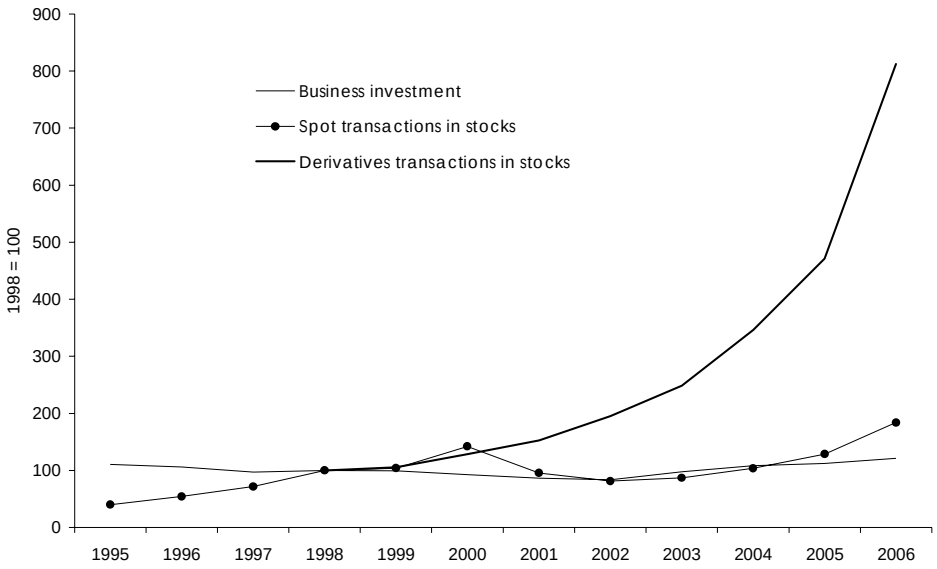


Source: BIS, WFE, Deutsche Börse/EUREX, OECD.

In the foreign exchange markets most derivatives transactions are carried out over the counter, and, hence, stem from professional traders. However, by far most trades of interest rate derivatives take place on organized exchanges (in Germany and North America roughly 90%, in the UK roughly 70%). This difference points at one possible cause of the exorbitant boom in trading interest derivatives: the rising participation of amateur speculators. Interest rate futures like the widely traded Euro Schatz, Euro BOBL and Euro BUND futures (at EUREX) as well as a tremendously wide variety of interest options are particularly attractive for private speculators. This is so for at least three reasons. First, there is easy access to electronic trading platforms provided by internet brokers. Second, transaction costs of exchange-traded futures and options have become extremely low. Third (probably most important), margin requirements of interest futures are very low, hence, the related leverage appears attractive[26]).

[26]) The comparatively low margin requirements of interest rate futures are due to the fact that interest rates are less volatile than stock prices or commodities prices. Hence, the chances of profits (and risks of losses) from trading interest rate derivatives are not systematically greater than from trading other types of derivatives with higher margin requirements. It seems therefore plausible that the main reason for the attractiveness of interest rate derivatives stems from the fact that one needs comparatively little cash to participate in the "game".

Figure 6a: Business investment and stock transactions in Germany

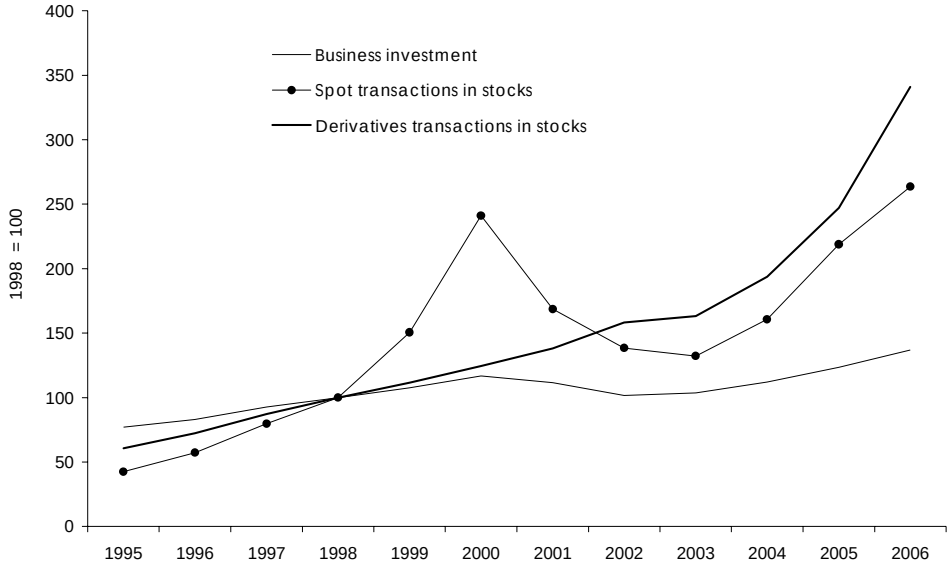


Source: BIS, WFE, Deutsche Börse/EUREX, OECD.

Figures 6 and 7 provide a comparison between the development and the level of stock market transactions on the one hand, and nominal investment expenditures of the business sector on the other hand. In Germany, business investment has stagnated since the mid 1990s and has only recently recovered. By contrast, transactions in German stock markets have been booming. Whereas spot transactions have risen by "only" 83.5% between 1998 and 2006, the trading volume of stock (index) futures and options expanded by 712.8% over the same period (as figure 6a shows the trading volume of stock market derivatives seems to be on a bubble path). As a consequence, in 2006 the volume of stock trading in Germany was almost 100 times larger than investment expenditure of the business sector, and the transaction volume of stock derivatives was roughly ten times higher compared to spot transactions. By now, both ratios are considerably higher in Germany than in the UK as well as in the US (figure 7).

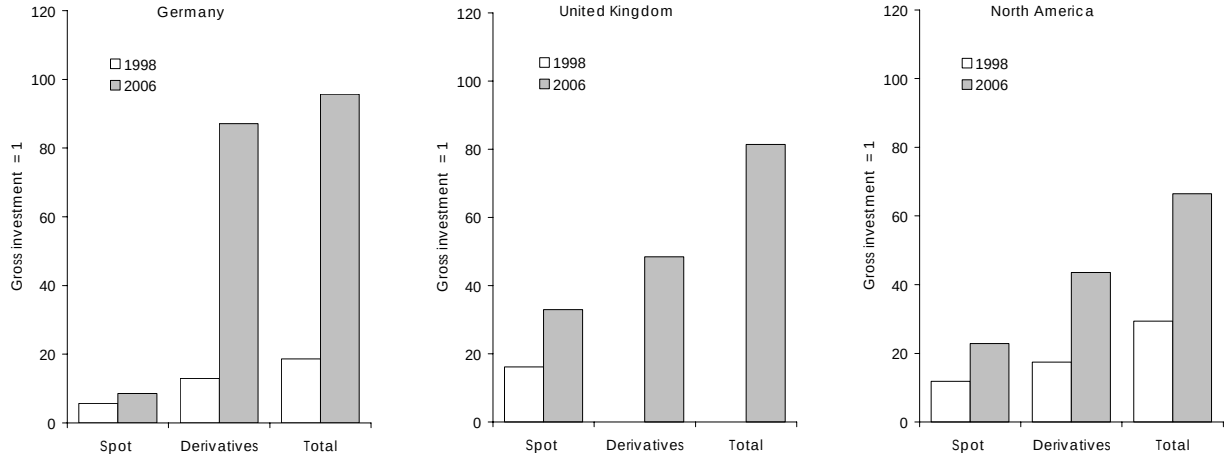
Figure 6b shows that the volume of spot transactions in the stock market in the US has risen faster than in Germany over the medium run. Over the short run, the spot trading volume in the US is more affected by stock price fluctuations than is the case in Germany. Also in the US stock trading in the derivatives markets has expanded faster than in the spot market, however, this difference has been much smaller than in Germany.

Figure 6b: Business investment and stock transactions in North America



Source: BIS, WFE, OECD.

Figure 7: Gross business investment and stock transactions

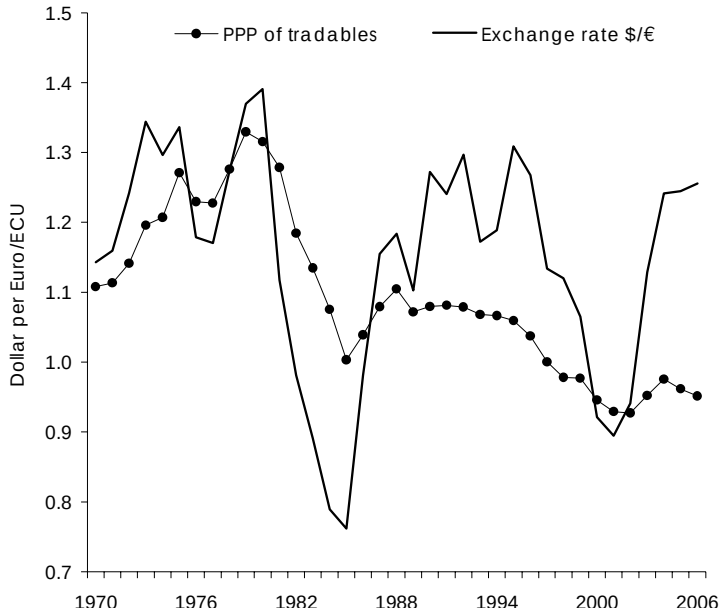


Source: BIS, WFE, Deutsche Börse/EUREX, OECD.

4.2 Some observations about asset price dynamics

We will now present some empirical evidence on the development of asset prices. First, we will look at the long-term overshooting of exchange rates, stock prices and the price of crude oil.

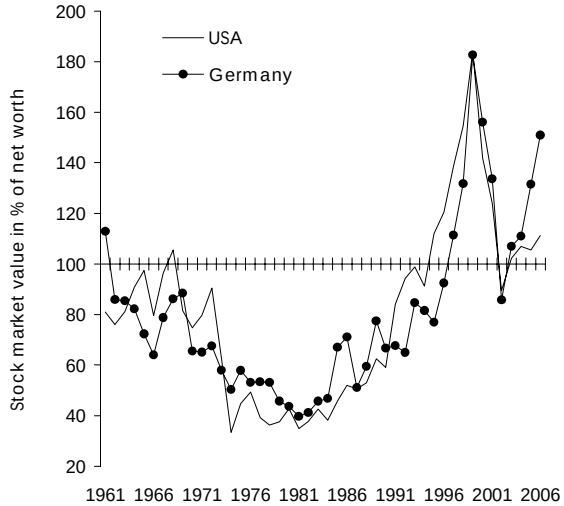
Figure 8: Dollar/euro exchange rate and purchasing power parity



Source: OECD, WIFO (*Schulmeister,* 2005).

Figure 8 shows the long swings of the dollar/euro (ECU) exchange rate around its fundamental equilibrium as approximated by purchasing power parity (PPP) based on a basket of internationally traded goods and services (for methodological issues of calculating PPP of tradables see *Schulmeister*, 2005). Even though PPP of tradables adjusts to a larger extent to persistent exchange rate movements than PPP based on a GDP basket, the deviations of the exchange rate from its fundamental equilibrium are still considerable. At the same time the overall picture suggests that exchange rate overshooting is rather the rule than the exception in medium-term and long-term exchange rate dynamics.

Figure 9: Stock market value and net worth of non-financial corporations

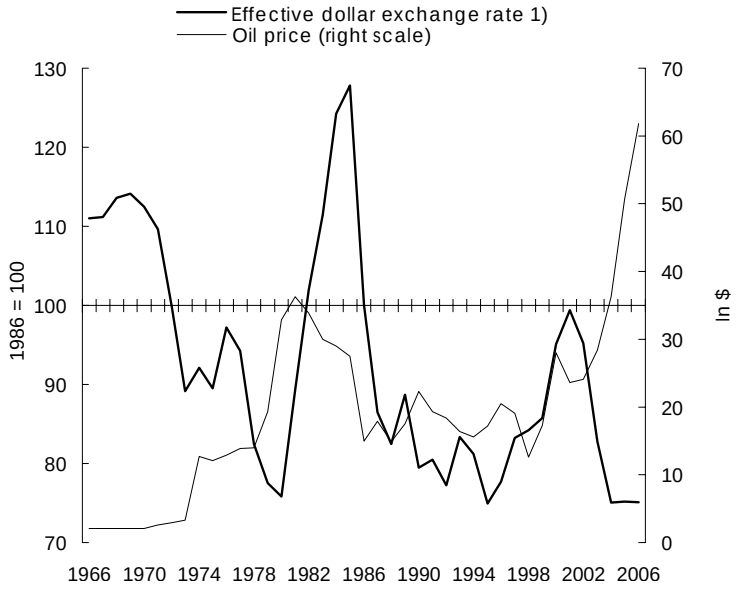


Source: Fed, Deutsche Bundesbank, WIFO (*Schulmeister,* 2003).

Figure 9 provides some evidence about the overshooting of stock prices over the long run. It shows the ratio between the market capitalization of non-financial corporate business and its net worth (real assets plus net financial assets)[27]). Over the 1960s and 1970s stock prices in the US as well as in Germany became progressively undervalued as real investment and, hence, the capital stock grew strongly, whereas stock prices almost stagnated. The opposite development took place between the early 1980s and the late 1990s.

Even though it is almost impossible to quantify the fundamental equilibrium level of crude oil prices one can safely conclude that the extent of the long swings of crude oil prices is too large to be justified by changes in fundamentals. Since the prices of crude oil (of different qualities) are essentially determined in the market for oil futures figure 10 adds some evidence about the tendency of financial markets to overshoot over the medium and long run.

Figure 10: Dollar exchange rate and oil price fluctuations



Source: OECD, IMF. – [1]) Vis-à-vis DM, French franc, British pound, yen (SDR weights).

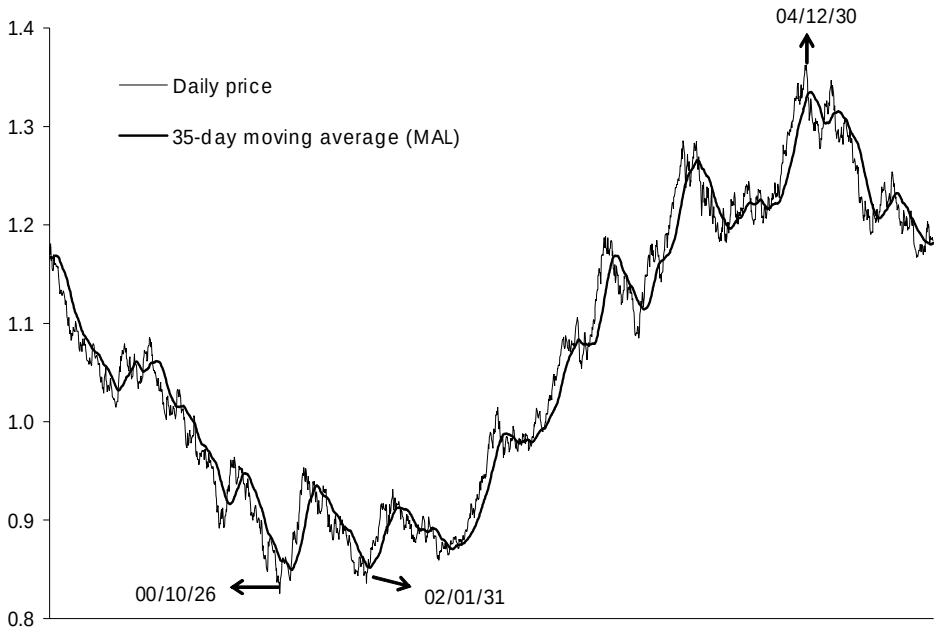
As regards the oil (futures) market one might even hypothesize that the overshooting of oil prices is to some extent influenced by the – inverse – overshooting of another asset price, i.e., the dollar exchange rate. Such a contagion effect seems plausible because crude oil is exclusively priced in dollars. Hence, any strong dollar depreciation as between 1971 and 1973, between 1976 and 1978 or since 2001 let oil exporters attempt to put through an (over)compensating oil price increase (whether they are successful or not depends on several other factors – see *Schulmeister*, 2000, for a discussion of this issue).

We shall now present some evidence how very short-term asset price movements on the basis of intraday data can bring about long-term cycles. We take the cycle of the dollar/euro exchange rate as an example (see figure 11). In early 1999 one euro was worth 1.17 $, then the exchange rate fell to 0.83 $ until October 2000, it started to rise again in February 2002

[27]) The data stem from "flow-of-funds-accounts". For a detailed documentation see *Schulmeister* (2003).

and reached 1.36 $ by December 2004. Over the year 2005 the euro fell again and reached its initial level of 1.17 $ by the end of November 2005.

Figure 11: Cycle of the dollar/euro exchange rate and technical trading signals 1999-2005

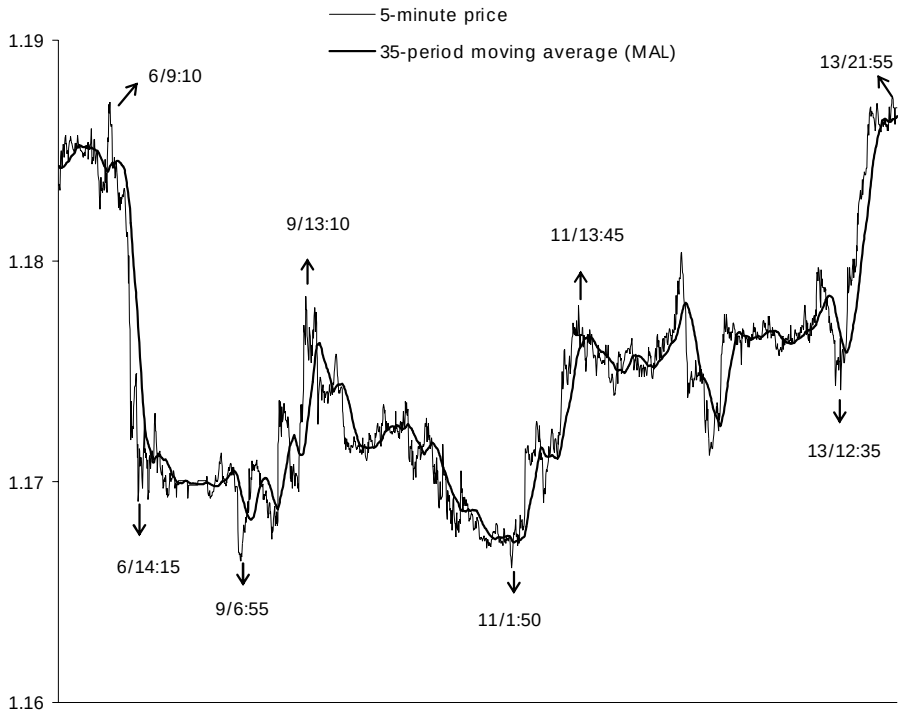


Source: Fed, WIFO.

This exchange rate cycle has been completed in a sequence of upward and downward trends. For example, the euro depreciation between January 1999 and October 2000 was brought about in three downward trends which were interrupted by only small counter-movements (figure 11). In a similar manner the euro appreciation between February 2002 and December 2004 was realized in a sequence of several trends, each lasting some months. Only between October 2000 and January 2002 did the trending behavior of the dollar/euro exchange rate not result in a medium-term appreciation or depreciation (the two upward and downward trends roughly compensated each other).

The pattern of exchange rate dynamics as a sequence of trends, sometimes interrupted by non-directional movements ("whipsaws"), seems to repeat itself across different time scales. Figure 12 displays exchange rate movements based on five-minute data over six business days in June 2003 (this sample covers roughly the same amount of data points as the seven-year period displayed in figure 11). Closer inspection reveals that the exchange rate fluctuates also over the very short run in a sequence of trends, sometimes interrupted by "whipsaws" as during afternoon trading (GMT) on June, 6, and on June, 11.

Figure 12: Technical trading signals based on intraday dollar/euro exchange rates, June, 6-13, 2003



Source: Olsen Financial Technologies, WIFO.

In a forthcoming study the relationship between persistent exchange rate movements based on high frequency data (at 1, 5 and 30 minutes intervals) and long-term currency trends is explored in an inductive manner (*Schulmeister*, 2007B, 2008). It is shown that over a long period (sometimes several years) very short-term, yet persistent movements ("runs" = monotonic movements) in one direction last longer than counter-movements. Hence, the accumulation of these runs results in a medium-term upward or downward trend lasting some weeks or even months. Again, these medium-term trends last for some years longer than counter-trends causing the exchange rate to overshoot in a stepwise process.

Medium-term appreciation (depreciation) trends are therefore due to upward (downward) runs on the basis of intraday data lasting longer than downward (upward) runs. In other words, medium-term trends are not brought about by movements in line with the trend being steeper than counter-movements as efficient market theory would expect. Technical speculators try to exploit the phenomenon of persistent price movements at different data frequencies, and by doing so strengthen the "trending" of exchange rates over the short run.

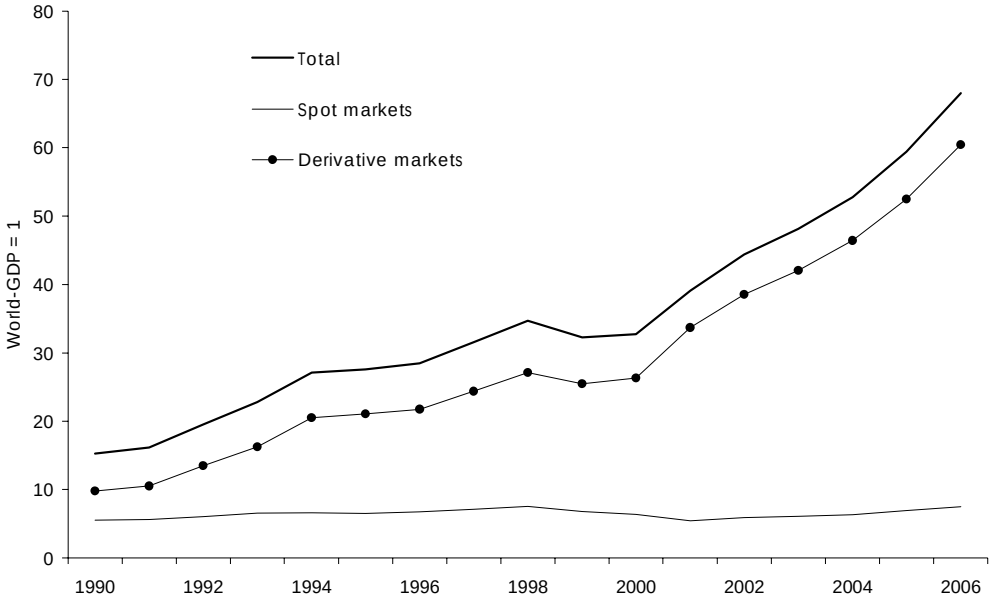
The phenomenon that persistent price movements in one direction last for several years in one direction longer than the counter-movements has to be attributed to the presence of an expectational bias in favor or against a currency. E.g., if a bias against the dollar prevails traders will put more money into an open dollar position if the dollar is going down than when it is going up. By the same token, a short dollar position will be held (some seconds or minutes) longer than a long position if a bias against the dollar prevails.

If this pattern of exchange rate dynamics is typical for asset prices in general (first calculations confirm this presumption) then a general FTT would not only dampen short-term asset price fluctuations as s sequence of upward and downward runs but also the overshooting over the long run.

4.3 Development of financial transactions by instruments, regions and countries

In this section we document the development of transaction volumes of the most important spot and derivative instruments worldwide as well as in the most important regions and countries. To give a concrete picture also of the levels of trading, the data are expressed as multiples of the nominal GDP of the respective region or country.

Figure 13: Overall financial transactions in the world economy

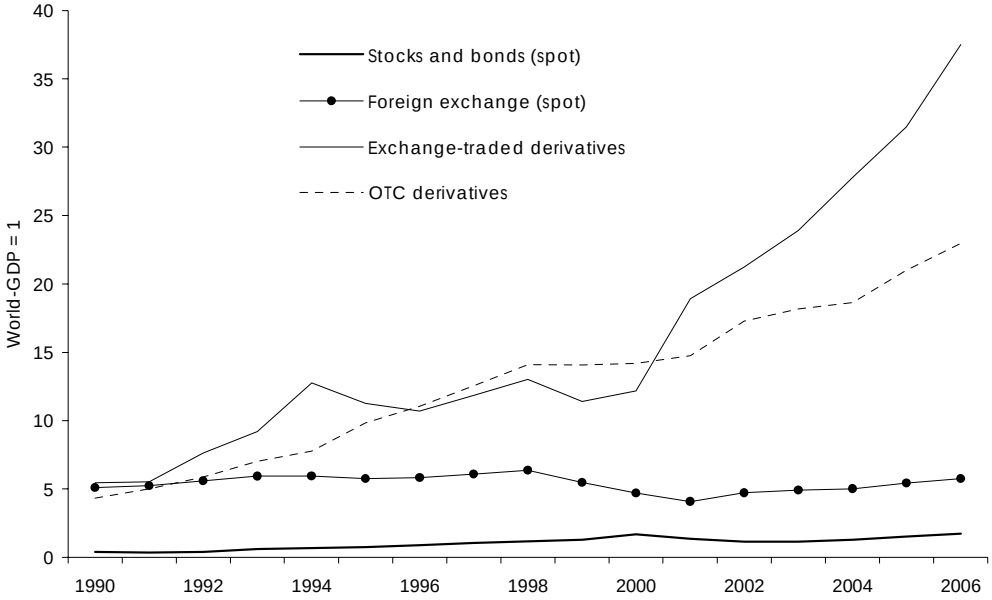


Source: BIS, WFE, OECD, OEF.

In 2006 overall financial transactions in the global economy were 68.0 times higher than nominal world GDP (figure 13). In 1990, this ratio amounted to 15.3% only, hence, since then financial transactions have been growing 4.4 times faster than GDP. This difference has increased considerably since 2000.

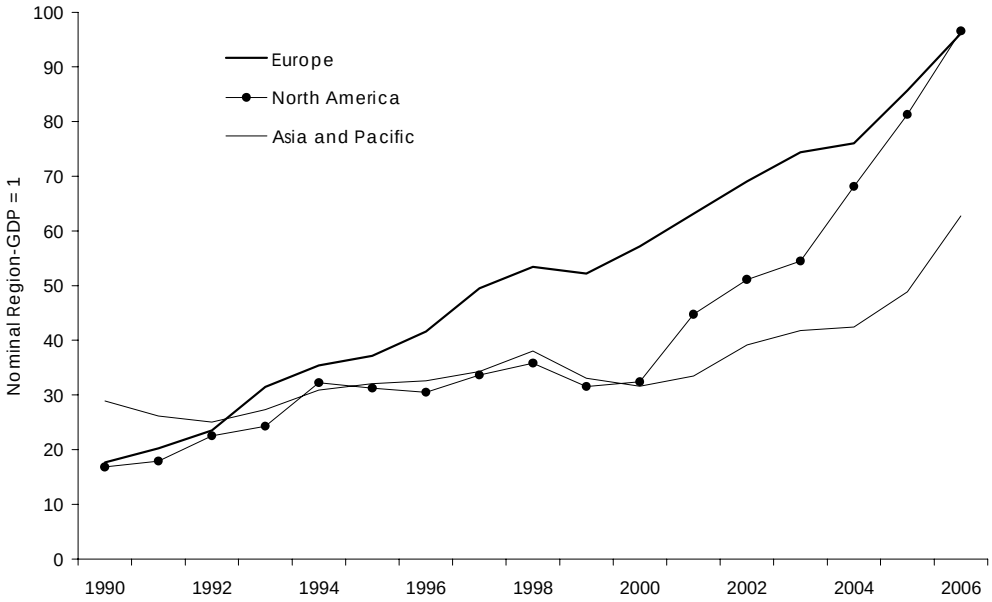
Spot transactions of stocks, bonds and foreign exchange have expanded roughly in tandem with nominal world GDP, hence, the overall increase in financial trading is exclusively due to the spectacular boom of the derivatives markets (figure 14). Of the latter, futures and options trading on exchanges – where also amateur investors can participate – has expanded much stronger since 2000 than trading of professionals (OTC).

Figure 14: Financial transactions in the world economy by instruments



Source: BIS, WFE, OECD, OEF.

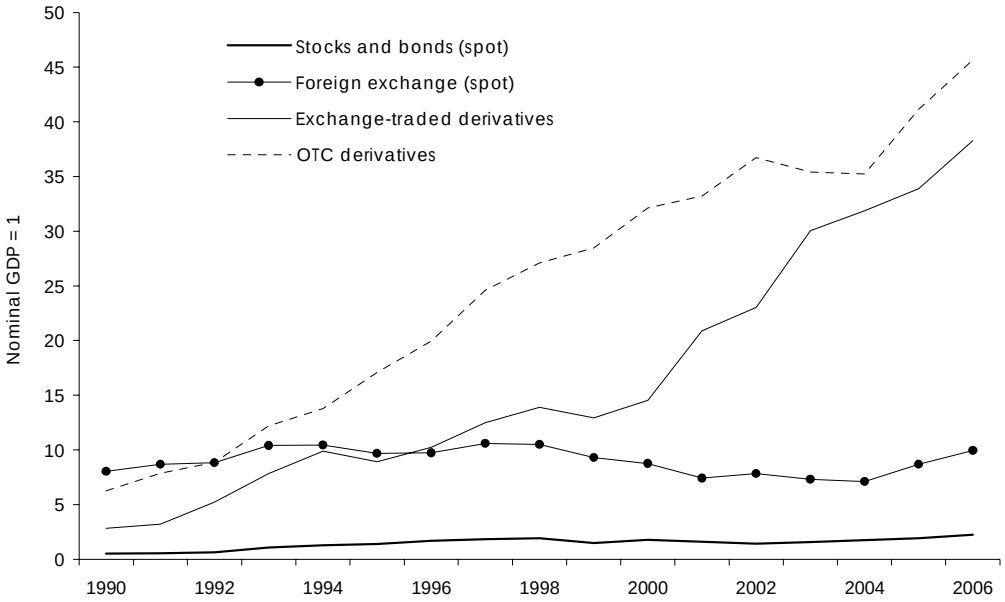
Figure 15: Overall financial transactions by regions



Source: BIS, WFE, OECD.

The development of overall financial transactions in Europe and North America has been similar, in the Asian-pacific regions financial markets expanded somewhat slower: In 2006, trading volume was almost 100 times higher than nominal GDP in North America and Europe (EU-27 plus Norway and Switzerland), in Asia it was roughly 63 times higher.

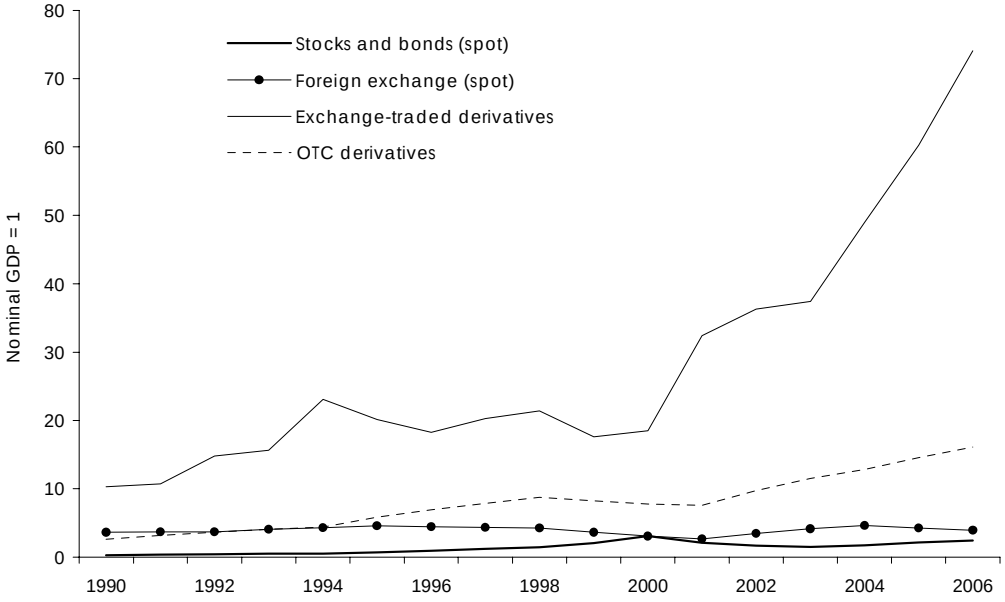
Figure 16a: Financial transactions in Europe by instruments



Source: BIS, WFE, OECD, OEF.

Also the structure of financial transactions by instruments changed in a similar way in Europe and North America. However, the level of transactions differs considerably between the two regions. In Europe OTC trading is more important (both, foreign exchange spot transactions as well as derivatives trading), in the US the trading of futures and options on exchanges has by far the greatest weight. In both regions, the share of spot transactions of stocks and bonds amounts only to roughly 2% (figures 16a and 16b).

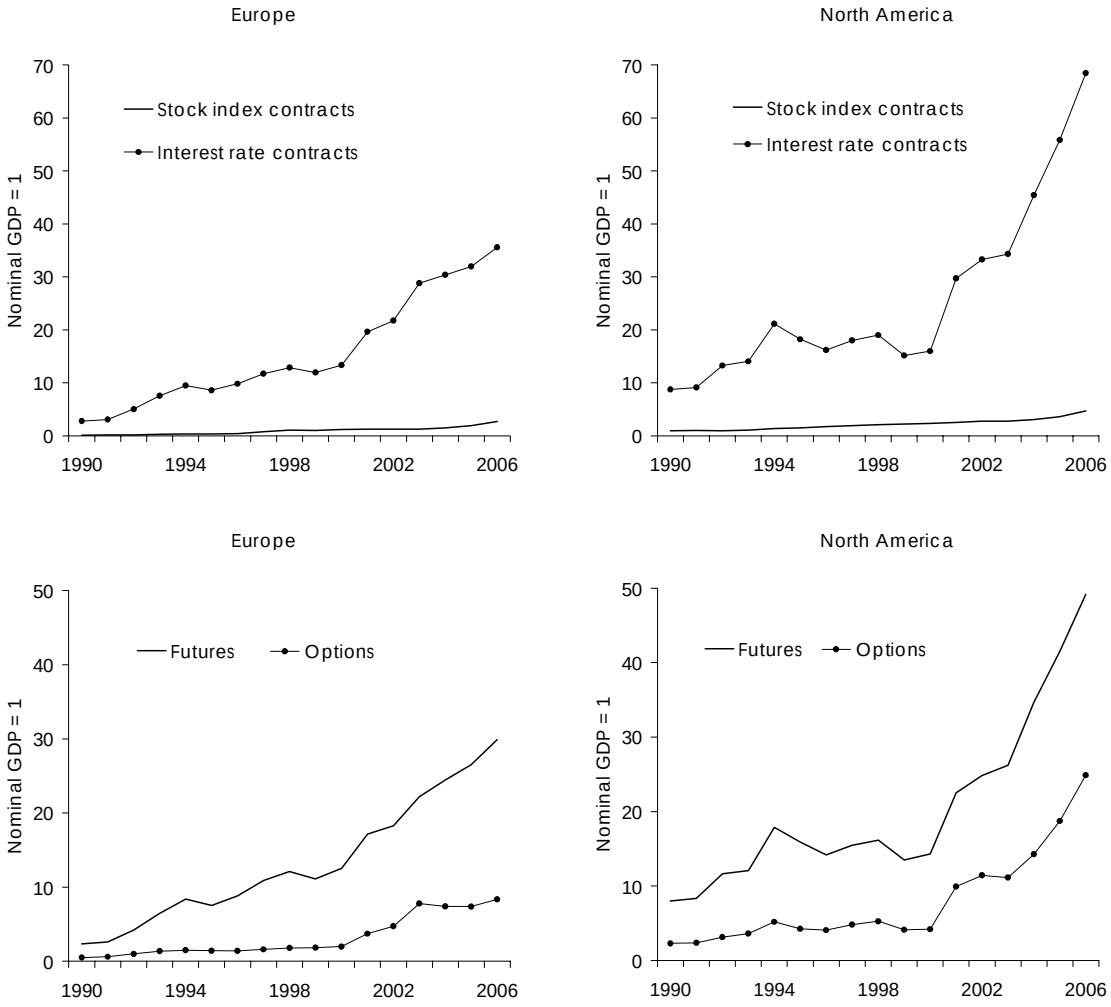
Figure 16b: Financial transactions in North America by instruments



Source: BIS, WFE, OECD, OEF.

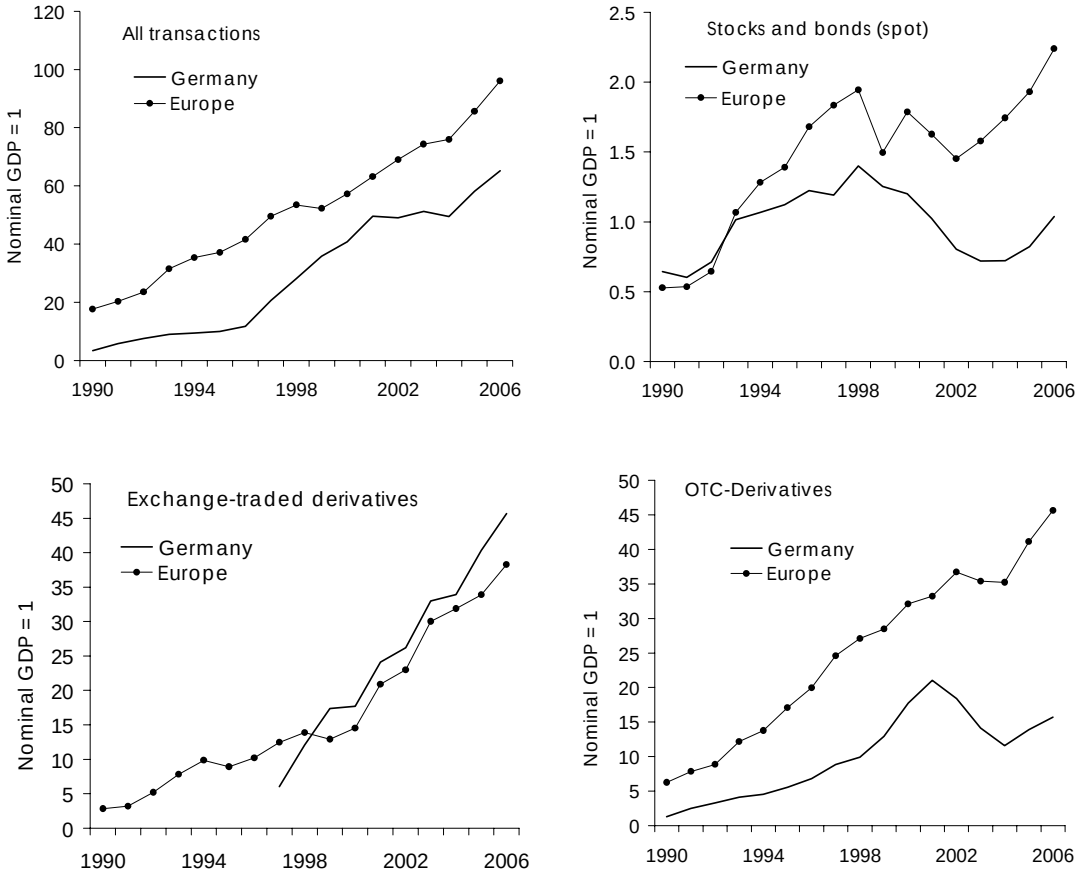
Figure 17 shows that among exchange-traded derivatives interest contracts are much more heavily traded than stock index contracts. In North America trading volume was almost 70 times higher than nominal GDP, in Europe this ratio amounted to almost 40. This difference implies that hedging activities cannot account for both, the level as well as the expansion of trading interest contracts, in particular futures. The main reason might be the low transaction costs and margin requirements which makes interest futures an extremely attractive instrument for short-term speculation (by professionals as well as by amateurs).

Figure 17: Transactions on exchange-traded derivatives in Europe and North America



Source: BIS, WFE, OECD.

Figure 18: Financial transactions in Europe and Germany



Source: BIS, WFE, Deutsche Börse/EUREX, OECD.

Even though the UK remains the by far most important financial market place in Europe, Germany has to some extent caught up. This can be shown by a comparison of the development of trading volumes in Germany and Europe as a whole[28]). Overall financial transactions in Germany were "only" 65.2 times higher than nominal GDP as compared to 96.1 in Europe (figure 18). However, due to the success of EUREX, in 2006 the volume of exchange-traded derivatives alone was already 45.7 times higher than nominal GDP in Germany, in Europe it was "only" 38.3 times higher.

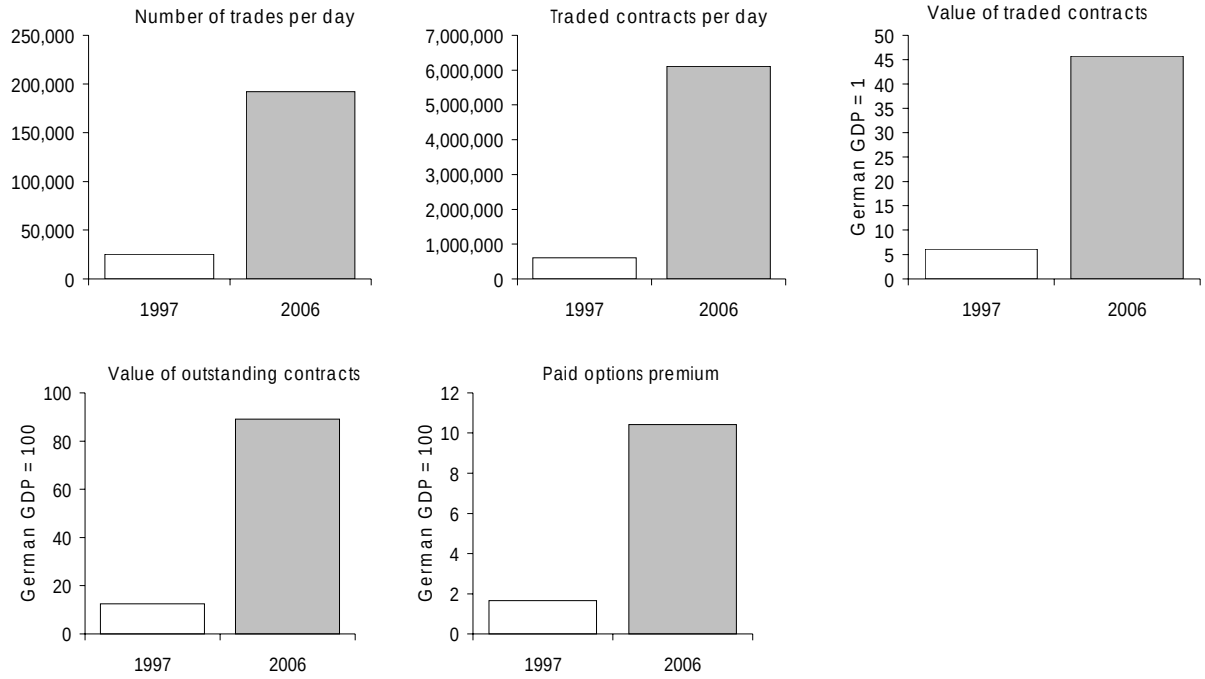
Figure 19 presents some indicators of derivatives trading at EUREX. In 2006 roughly 192.000 trades were carried out per day, the daily turnover in terms of traded contracts was roughly 6.1 million. Trading volume in terms of notional values amounted to roughly € 424 billion per day (on an annual basis 45.7 times the German GDP). Payments for options premiums alone amounted to 10.4% of GDP.

These observations let one presume that there might be some "excessive" liquidity in derivatives markets in Germany (but not just there) which stems primarily from speculation of

[28]) In 2006, roughly 66% of all transactions in Europe took place in the UK and roughly 13% in Germany. Therefore the statistics on the development of financial transactions in Europe reflect to a large extent the development in the UK.

actors with heterogeneous expectations. At the same time, derivatives trading itself represents a zero sum game[29]). Now, institutional (professional) traders like banks or hedge funds report continuously high profits from trading (including from position taking). This is certainly not true for every single bank or hedge fund (even though the "giants" in trading like Goldman Sachs or Deutsche Bank report ever rising profits from trading financial instruments). However, it is true that institutional traders as a group make consistently high profits from taking open positions in asset markets.

Figure 19: Indicators of derivatives trading at EUREX

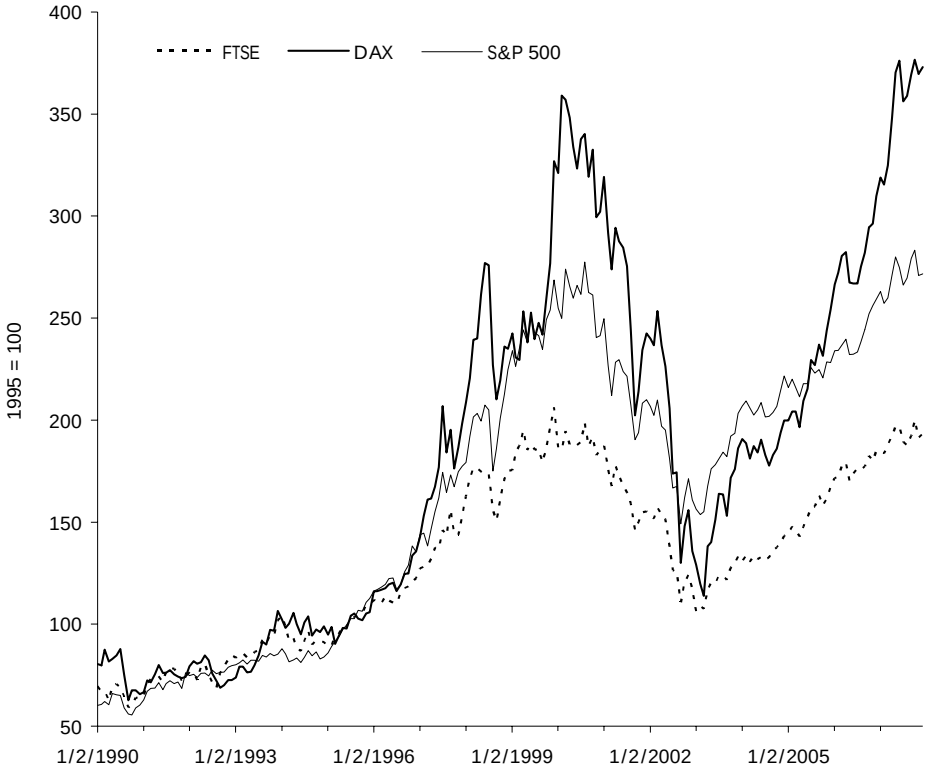


Source: Deutsche Börse/EUREX, OECD.

The huge speculation profits of professional traders as a group begs the question: who are the losers (as a group)? The most plausible answer would be: the private (amateur) traders. However, this can hardly be proved empirically, not least because information about profits and losses is not distributed symmetrically. E.g., among amateur traders there is much more talking about "how I made a great deal" than about losses. In a similar manner, the most popular "speculation magazines" like "The Technical Analyst" regularly document the (ex-post-)performance of certain profitable trading systems but do not report how many other systems produce losses.

[29]) This statement refers to the equality of the sum of profits and losses. Even though the transfer of risk from hedgers to speculators provides a "net utility" one has to keep in mind that hedging accounts only for a small share of transactions in modern asset markets – most transaction take place between speculators with heterogeneous expectations.

Figure 20: Stock price fluctuations in Germany, the United Kingdom and the US



Source: International Financial Statistics.

Finally, we would like to compare stock price fluctuations between the traditional financial market places in the UK and the US on the one hand and Germany on the other one. Figure 20 shows that the overshooting of stock prices has been remarkably more pronounced in Germany as compared to the US markets as well as to the UK markets[30]). It seems promising to prove more in detail the hypothesis that this difference is related to the catching up of financial institutions in Germany (Deutsche Börse, Deutsche Bank, etc.) as global players in international finance. This process could be interpreted as part of a general tendency towards a "predominance of speculation over enterprises" which might be particularly pronounced in Germany.

4.4 Some preliminary conclusions

The main observations about transactions volumes and price dynamics in financial markets can be summarized as follows:

- Observation 1: There is a remarkable discrepancy between the levels of financial transactions and the levels of the "underlying" transactions in the "real world". E.g., the volume of foreign exchange transactions is almost 70 times higher than world trade of

[30]) As a performance index the DAX should exhibit a stronger upward drift as compared to the "pure" stock price indices S&P 500 and FTSE. However, also the downward trends between 2000 and 2003 were more pronounced in the case of the DAX as compared to the S&P 500 and the FTSE (figure 20).

goods and services. In Germany, the UK and the US, the volume of stock trading is almost 100 times bigger than business investment, and the trading volume of interest rate securities is even several 100 times greater than overall investment.

- Observation 2: For all types of assets, these discrepancies have risen tremendously since the late 1990s. In other words, financial transactions have expanded several times faster than transactions in the "underlying" markets for goods and services ("real-world-transactions"). Trading volumes of interest rate securities grew by far the most, followed by stock trading and, with some distance, by foreign exchange trading.
- Observation 3: Trading in derivatives markets has expanded significantly stronger than trading in spot markets, this holds true for any kind of asset/instrument. In the world economy, derivatives trading volume is roughly 50 times higher than world GDP, whereas spot trading amounts to "only" 7.5 times world GDP. In Europe and the USA, these ratios are significantly higher, amounting to 84.0/12.1, and 85.9/6.1, respectively.
- Observation 4: Asset prices like exchange rates, stock prices or crude oil prices fluctuate in a sequence of long-term upward trends ("bull markets") and downward trends ("bear markets") around its fundamental equilibrium.
- Observation 5: These trends are the result of the accumulation of extremely short-term runs (on the basis of intraday data) which last longer in one direction than the counter-movements. When the market is "bullish", upward runs last longer than downward runs, when the market is "bearish", the opposite is the case.

These observations suggest that financial markets are characterized by excessive liquidity and by excessive long-run volatility of prices (i.e., strong and persistent deviations from their fundamental equilibria). Hence, these observations are rather in line with the "world-II-picture" of financial markets than with the "world-I-picture". This can be (preliminarily) concluded from the evidence for the following reasons:

- Price expectations of market participants must be (very) heterogeneous and must have become progressively more so because otherwise trading (opportunities) had not risen so much faster than transactions in the "underlying" goods markets (observations 1 – 3).
- The spectacular rise of derivatives trading cannot be caused primarily by hedging activities for at least two reasons. First, the volume of derivatives transactions is just much too big to be accounted for by hedging (observation 3). Second, if hedging was the main driving force of derivatives trading, the growth of transactions of interest rate derivatives, stock (index) derivatives, and foreign exchange would not be as different as is actually the case (observation 2).
- As a consequence, the greatest part of derivatives transactions has to be attributed to speculative trades between actors with heterogeneous price expectations. Whereas OTC trading is restricted to professionals, derivatives trading on exchanges is open to the general public. The fact that futures and options trading on exchanges has expanded faster than trading of OTC derivatives is indirect evidence that a rising number of amateurs participate in these activities. This presumption is further confirmed by the spectacular rise of transactions of interest rate derivatives (observation 2) which are most

attractive for private speculators (due to low transaction costs and low margin requirements).

- The pattern of asset price dynamics as a sequence of very short-term runs which accumulate to "bull markets" or "bear markets" and, hence, to long swings around the fundamental equilibrium suggests that the cumulative effects of increasingly short-term transactions are rather destabilizing than stabilizing. The growing importance of technical trading systems in financial markets might contribute significantly to this pattern of price dynamics. This seems plausible for at least two reasons. First, technical trading strengthens and lengthens persistent price runs. Second, technical trading is increasingly based on high frequency (intraday) data.

Even if the empirical evidence suggests that trading behavior and price dynamics in financial markets confirm rather the "world-II-picture" as compared to the "world-I-picture", there remains still the question whether or not a general and uniform FTT will reduce specifically the "excessive" liquidity and the related overshooting of asset prices. For lack of experience with such a tax, an unambiguous answer to this question is certainly not possible. However, it seems at least probable that an FTT will dampen "excessive" liquidity to a larger extent than the "basic" liquidity needed for market efficiency. This can be presumed based on the following reasoning.

Surveys among foreign exchange traders reveal unambiguously that trading decisions are the more based on technical analysis (and the less on fundamentals) the shorter their time horizon is (see, e.g., *Menkhoff – Taylor*, 2007; *Gehrig – Menkhoff*, 2006). It seems highly probable for at least three reasons that this result also holds true for other asset markets (for which there are no surveys about trading behavior available). First, in normal times there are simply not enough relevant news on fundamentals to explain the frequent switches of professional traders between long and short positions during a trading day. Second, also the increasingly popular "day trading" of amateurs is almost exclusively based on technical models (see, e.g., *Deel*, 2000; *Velez – Capra*, 2000). Third, also the so-called "automated trading systems" based on technical analysis process high frequency price data.

Since a general FTT makes transactions the more costly the shorter the time horizon is, it will dampen specifically technical trading. At the same time, technical trading strengthens and lengthens price runs which in turn accumulate to medium-term trends. As a consequence, an FTT should reduce "excessive liquidity" stemming from transactions which are very short-term oriented and destabilizing at the same time.

Since an FTT increases transaction costs the more the lower they are (before tax), it will generally hamper derivatives trading to a greater extent than spot trading. Since spot transactions are more long-term oriented and, hence, based to a larger extent on fundamentals than (speculative) derivatives transactions (such an assumption seems plausible at least with respect to stocks and interest rate securities) one can presume that an FTT will hamper primarily short-term, non-fundamental transactions. At the same time, derivatives transactions for hedging purposes would not be affected by a low FTT (between 0.1% and 0.01%) since one usually needs just one transaction for hedging an open position stemming from "real-world-transactions" (e.g., future export earnings in foreign currency).

5. The revenue potential of a general financial transaction tax

The revenue potential of financial transaction taxes depends on the tax rate, on the turnover on the financial markets subject to taxation as well as on the impact of the tax on trading volumes. At first, we will present an overview over the resources of data on financial transactions which form the basis for the estimation of the revenue potential of a general FTT (also the presentation of major trends in the development of financial transaction in section 4 is based on these data). We will then clarify our assumptions on the reaction of trading volumes to the introduction of a general FTT of 0.1%, 0.05%, and 0.01%, respectively, differentiated by type of instrument. Finally, we shall present the estimation results.

5.1 Data base

Table 5 gives on overview over the different types of financial markets and instruments. There are two major sources of data on transactions on these markets, the Bank of International Settlements (BIS) and the World Federation of Exchanges (WFE).

Table 5: Financial markets and instruments

Types of market	Main instruments	Main sources of transactions data
Money market		
Spot market		
OTC	Money market instruments (e.g., short-term bank deposits)	N.A.
Derivatives market		
Exchanges	Futures and options on short-term bank deposits (up to 3 month)	WFE, BIS[1])
OTC	Forward rate agreements Interest rate swaps Interest rate options	BIS
Credit market		
Spot market	Bank credit (not conceived as "financial transaction")	
Derivatives market		
OTC	Credit default swaps	BIS
Capital market		
Spot market		
Exchanges	Stocks and bonds	WFE
OTC	Bonds	N.A.
Derivatives market		
Exchanges	Stock (index) futures and options Long-term interest rate futures and options	WFE, BIS[1])
OTC	Forward rate agreements Interest rate swaps and options with maturities longer than 3 months Interest rate options	BIS
Foreign exchange market		
Spot market		
OTC	Outright exchange of foreign currencies	BIS
Derivatives market		
Exchanges	Foreign exchange futures and options	WFE, BIS[1])
Commodities market		
Spot market	-	-
Derivatives market		
Exchanges	Commodities futures and options	WFE

[1]) Aggregate data for the following regions: Europe, North America, Asia and Pacific, other.

Table 6 specifies the "specialization" of these two supranational institutions with respect to financial transactions data. Data on spot transactions of stocks and bonds on exchanges are collected by WFE, data on OTC transactions are collected by the "Triennial Central Bank Survey" organized by BIS (this survey takes place over the month of April since April 1989). Our data base includes the results of the survey of April 2007 (*BIS*, 2007). Annual transaction volumes for years when a "Triennial Central Bank Survey" took place, are estimated by multiplying the daily averages during April by 250 (benchmark of the number of trading days per year). Data for the years between survey years are obtained through linear interpolation.

Data on exchange-traded derivatives are available from BIS as well as from WFE with the following differences: BIS provides time series on the trade of stock index contracts, interest contracts and currency contracts (futures and options), however, only for four regions (Europe, North America, Asia and Pacific, other). By contrast, WFE data are available for single exchanges which are members of WFE (some minor exchanges are therefore not covered), they also include commodities contracts, however, in many cases time series are available only from 2002 on.

Table 6: Main sources of financial transactions data

	Exchange-traded instruments		OTC-traded instruments	
	Spot	Derivatives	Spot	Derivative
Stocks	WFE	WFE, BIS[1])	-	BIS
Interest rate securities	WFE	WFE, BIS[1])	N.A.	BIS
Foreign exchange	-	WFE, BIS[1])	BIS	BIS
Commodities	-	WFE	-	BIS
Credit default swaps	-	-	-	BIS

Notes: - Indicate that transactions are either non-existing or negligible, as opposed to non-available (N.A.). – [1]) Aggregate data for the following regions: Europe, North America, Asia and Pacific, other.

Therefore, we adopted the following approach as regards data on transactions of exchange-traded derivatives. When dealing with regions we used BIS data, when dealing with single countries we used WFE data. In the case of Germany, we used data directly obtained from Deutsche Börse/EUREX.

Tables A2 and A3 in the annex document in detail the coverage of the data provided by BIS and WFE.

5.2 Reduction of trading volumes due to a general FTT

In order to figure out to which extent a general FTT might increase transaction costs we conducted interviews with brokerage firms and checked the commissions charged by internet brokers. The purpose was to arrive at rough estimates of actual costs of a one-way-transaction of different financial instruments.

Since exchange-traded derivatives have become the most important type of financial instruments, we have given particular attention to gauging the respective transaction costs (relative to the notional contract values). Table A4 in the annex shows that these costs are below 0.01% for all financial futures, they are particularly low for trading interest rate contracts. Trading commodities contracts is somewhat more "expensive", yet the cost of a one-way-transaction is still less than 0.05% of contract value. Since it seems probable that the reaction of the trading volume to the introduction of a general FTT will also be affected by the size of margin requirements, we report also the latter in table A4 in the annex. It turns out that margins of interest rate contracts are by far lower than margins of stock index futures and commodities futures.

Due to the different intermediation channels used by private traders (ranging from ordinary banks to discount brokers), the variance of the actual transaction costs is certainly very high. More relevant in the context of an FTT is the fact that transaction costs in those markets which have expanded most over the past 25 years, i.e., the market for financial derivatives, are by roughly 99% lower than in the spot markets for stocks and bonds. To put it differently: transaction costs in "traditional" spot markets are roughly 100 times higher than in "modern" derivatives markets. Hence, it does not seem reasonable to apply tax elasticities of trading volumes with respect to transaction costs or taxes (as part of the former) derived from spot markets to derivatives markets.

Table 7: Assumptions about transaction costs, leverage rates and the reduction of trading volume in response to the introduction of a transaction tax

	Transaction costs in %	Margin rate in %	Reduction of trading volume in % due to a transaction tax of								
			0.10%			0.05%			0.01%		
			low	medium	high	low	medium	high	low	medium	high
Spot transactions on exchanges											
Stocks	0.3	-	5	10	15	3	5	8	0	0	5
Bonds	0.2	-	3	5	10	0	3	6	0	0	3
Exchange traded deivatives											
Stock index	0.005	8.0	60	70	80	50	60	70	10	20	30
Interest rates	0.003	1.0	70	80	90	60	70	85	20	30	40
Foreign exchanges	0.004	3.0	65	75	85	50	65	75	15	25	35
Commodities	0.005	6.0	60	70	80	50	60	70	10	20	30
OTC	0.003	1.0	70	80	90	60	70	85	20	30	40

For these reasons, we followed a pragmatic approach by assuming ranges within which the reduction of trading volumes to the introduction of a general FTT will most probably lie. More specifically, we assumed for each of three possible tax rates (0.1%/0.05%/0.01%) three scenarios concerning the reduction of the trading volume. These assumptions are summarized in table 7. To explain its meaning concretely let us take the medium scenario for a tax rate of 0.1% as an example. In this case we assume that the volume of spot transactions in the stock and bond market would decline by 10% and 5%, respectively. By contrast, the

reduction of the trading volume of exchange-traded derivatives as well as of OTC transactions would lie between 60% and 70%.

Even though the assumptions summarized in table 7 are essentially technical, they are set according to the following reasoning: the lower transaction costs and margin requirements, and the higher the tax rate, the greater will the reduction effect of an FTT be.

5.3 Estimated revenues of a general financial transaction tax

All calculations assume that the tax base of the general and uniform FTT is the notional value of the respective transaction. This design of the FTT implies that the tax burden relative to the cash invested to acquire a certain instrument is the higher the lower are transaction costs and the higher is the leverage effect. E.g., if one buys a stock valued at 1,000 in the spot market, one has to pay 1,003 (including transaction costs of 0.3%), and 1,004, respectively (including an FTT of 0.1%). If one buys a bond future with a notional value of 100.000, one has to pay also 1,003 before FFT (we assume transaction costs of 0.003% and a margin rate of 1% as in table 7), yet, an FTT of 0.1% of notional value would raise this amount to 1,103. According to the same logic, an FTT would raise the cost of buying an option the more the deeper the option is out of the money. Hence, an FTT with a uniform tax rate applied to notional values will hamper specifically transactions of instruments with high leverages that are primarily used for short-term speculation.

Tables 8 to 10 report the estimation results of possible receipts of a general FTT of 0.1%, 0.05% or 0.01%, respectively, as percentage of nominal GDP (tables A5 to A7 of the annex report the absolute figures in billion US dollars). Table 8 shows the results for some selected European countries. In Austria, e.g., the overall receipts of an FTT of 0.1% would amount to 0.62% of GDP ($ 2.0 billion in 2006) in the medium "transactions-reduction-scenario" (TRS). If the tax rate were only 0.01%, tax receipts are estimated at 0.21% of GDP or $ 0.7 billion (hence, significantly more than a tenth of the receipt estimate at a tax rate of 0.1%). As the trading volume on exchanges is low in Austria, only OTC trading would contribute to the overall receipts of a general FTT. Relative to GDP, FTT revenues in Belgium und the Netherlands would be of roughly the same size as in Austria, they would be lower in Italy and higher in France (in the case of the medium TRS tax revenues in France are estimated to lie between $ 6.1 billion and $ 18.8 billion – table A5).

In Germany, overall tax revenues in the case of the medium TRS would amount to 1.50%, 1.07%, and 0.47% of GDP for tax rates of 0.1%, 0.05% and 0.01%, respectively (in absolute terms 43.3, 31.2, and $ 13.8 billion, respectively – see tables 9 and A6). Most of these revenues would stem from derivatives trading at EUREX (1.02%, 0.74%, and 0.33% of GDP, respectively, for the three different tax rates). Also OTC trading would substantially contribute to overall tax revenues. By contrast, tax revenues from spot transactions of stocks and bonds would be small (less than 0.1% of GDP even at a tax rate of 0.1%).

Table 8: Hypothetical transaction tax receipts in some European countries
In % of GDP

		Austria			France			Italy			Belgium			Netherlands		
	Tax rate	0.1	0.05	0.01	0.1	0.05	0.01	0.1	0.05	0.01	0.1	0.05	0.01	0.1	0.05	0.01
	Reduction in transaction volume															
Spot transactions on exchanges																
Stocks	Low	0.024	0.012	0.003	0.095	0.048	0.010	0.082	0.042	0.009	0.022	0.011	0.002	0.204	0.104	0.021
	Medium	0.023	0.012	0.003	0.090	0.047	0.010	0.077	0.041	0.009	0.021	0.011	0.002	0.193	0.102	0.021
	High	0.022	0.012	0.002	0.085	0.046	0.009	0.073	0.040	0.008	0.020	0.011	0.002	0.182	0.099	0.020
Bonds	Low	0.000	0.000	0.000	0.003	0.001	0.000	0.008	0.004	0.001	0.000	0.000	0.000	0.048	0.025	0.005
	Medium	0.000	0.000	0.000	0.003	0.001	0.000	0.008	0.004	0.001	0.000	0.000	0.000	0.047	0.024	0.005
	High	0.000	0.000	0.000	0.002	0.001	0.000	0.008	0.004	0.001	0.000	0.000	0.000	0.044	0.023	0.005
Total	Low	0.024	0.012	0.003	0.097	0.050	0.010	0.090	0.046	0.009	0.022	0.011	0.002	0.251	0.129	0.026
	Medium	0.023	0.012	0.003	0.092	0.049	0.010	0.085	0.045	0.009	0.021	0.011	0.002	0.240	0.126	0.026
	High	0.022	0.012	0.002	0.087	0.047	0.010	0.081	0.044	0.009	0.020	0.011	0.002	0.227	0.122	0.025
Derivatives transactions on exchanges																
Total	Low	0.003	0.002	0.001	0.000	0.000	0.000	0.033	0.020	0.007	0.000	0.000	0.000	0.000	0.000	0.000
	Medium	0.002	0.001	0.001	0.000	0.000	0.000	0.025	0.016	0.007	0.000	0.000	0.000	0.000	0.000	0.000
	High	0.001	0.001	0.000	0.000	0.000	0.000	0.016	0.012	0.006	0.000	0.000	0.000	0.000	0.000	0.000
OTC transactions																
Total	Low	0.893	0.595	0.238	1.126	0.751	0.300	0.357	0.238	0.095	1.516	1.011	0.404	1.094	0.729	0.292
	Medium	0.595	0.446	0.208	0.751	0.563	0.263	0.238	0.178	0.083	1.011	0.758	0.354	0.729	0.547	0.255
	High	0.298	0.223	0.179	0.375	0.282	0.225	0.119	0.089	0.071	0.505	0.379	0.303	0.365	0.273	0.219
All transactions																
	Low	0.920	0.609	0.241	1.224	0.801	0.311	0.479	0.304	0.112	1.538	1.022	0.407	1.345	0.858	0.318
	Medium	0.620	0.460	0.211	0.843	0.612	0.273	0.348	0.240	0.099	1.032	0.769	0.356	0.969	0.672	0.282
	High	0.321	0.236	0.181	0.463	0.329	0.235	0.216	0.145	0.086	0.525	0.390	0.305	0.591	0.395	0.244

As regards the size of financial transactions relative to nominal GDP, the UK is a "special case". Hence, also revenues from an FTT would be exceptionally high. E.g., even in the case of the high "transactions-reduction-scenario" our calculations imply overall tax revenues of 2.49% of GDP at a (low) tax rate of 0.01% (table 9).

Table 10 presents the estimated revenues of a general FTT for the world economy as a whole as well as for the main regions. In the case of the medium TRS overall tax revenues would amount to 1.52% of world GDP at a tax rate of 0.1%, and to 0.49% at a tax rate of 0.01%. In North America and Europe tax revenues would be similar in size (relative to nominal GDP), in the Asian-pacific region FTT revenues would be lower by roughly one third than in North America and Europe. In the rest of the world revenues would be negligible (amounting to less than 0.1% of GDP even in the case of the low TRS at a tax rate of 0.1%).

Table 9: Hypothetical transaction tax receipts in Germany and the United Kingdom
In % of GDP

		Germany			United Kingdom		
	Tax rate / Reduction in transaction volume	0.1	0.05	0.01	0.1	0.05	0.01
Spot transactions on exchanges							
Stocks	Low	0.089	0.046	0.009	0.303	0.155	0.032
	Medium	0.085	0.045	0.009	0.287	0.152	0.032
	High	0.080	0.043	0.009	0.271	0.147	0.030
Bonds	Low	0.010	0.005	0.001	0.135	0.070	0.014
	Medium	0.009	0.005	0.001	0.132	0.068	0.014
	High	0.009	0.005	0.001	0.125	0.065	0.014
Total	Low	0.099	0.051	0.010	0.438	0.224	0.046
	Medium	0.094	0.049	0.010	0.419	0.219	0.046
	High	0.089	0.048	0.010	0.396	0.212	0.044
Derivatives transactions on exchanges							
Stock index	Low	0.402	0.251	0.090	0.188	0.117	0.042
	Medium	0.302	0.201	0.080	0.141	0.094	0.038
	High	0.201	0.151	0.070	0.094	0.070	0.033
Interest rates	Low	1.078	0.719	0.288	5.694	3.796	1.518
	Medium	0.719	0.539	0.252	3.796	2.847	1.329
	High	0.359	0.270	0.216	1.898	1.424	1.139
Commodities	Low	0.000	0.000	0.000	0.002	0.001	0.000
	Medium	0.000	0.000	0.000	0.002	0.001	0.000
	High	0.000	0.000	0.000	0.001	0.001	0.000
Total	Low	1.480	0.970	0.378	5.884	3.915	1.561
	Medium	1.020	0.740	0.332	3.939	2.942	1.367
	High	0.561	0.420	0.286	1.993	1.495	1.172
OTC transactions							
Total	Low	0.560	0.374	0.149	6.381	4.254	1.702
	Medium	0.374	0.280	0.131	4.254	3.191	1.489
	High	0.187	0.140	0.112	2.127	1.595	1.276
All transactions							
	Low	2.140	1.394	0.538	12.704	8.393	3.309
	Medium	1.488	1.070	0.473	8.612	6.352	2.901
	High	0.836	0.608	0.408	4.517	3.302	2.492

Table 10: Hypothetical transaction tax receipts in the global economy
In % of GDP

		World			Europe			North America			Asia and Pacific			Other		
Tax rate / Reduction in transaction volume		0.1	0.05	0.01	0.1	0.05	0.01	0.1	0.05	0.01	0.1	0.05	0.01	0.1	0.05	0.01
Spot transactions on exchanges																
Stocks	Low	0.138	0.070	0.014	0.134	0.068	0.014	0.232	0.119	0.024	0.188	0.096	0.020	0.007	0.003	0.001
	Medium	0.130	0.069	0.014	0.127	0.067	0.014	0.220	0.116	0.024	0.178	0.094	0.020	0.006	0.003	0.001
	High	0.123	0.067	0.014	0.119	0.065	0.013	0.208	0.112	0.023	0.168	0.091	0.019	0.006	0.003	0.001
Bonds	Low	0.028	0.015	0.003	0.081	0.042	0.008	0.000	0.000	0.000	0.006	0.003	0.001	0.007	0.004	0.001
	Medium	0.028	0.014	0.003	0.079	0.040	0.008	0.000	0.000	0.000	0.006	0.003	0.001	0.007	0.004	0.001
	High	0.026	0.014	0.003	0.075	0.039	0.008	0.000	0.000	0.000	0.006	0.003	0.001	0.007	0.004	0.001
Total	Low	0.166	0.085	0.017	0.214	0.110	0.022	0.232	0.119	0.024	0.194	0.099	0.020	0.014	0.007	0.001
	Medium	0.158	0.083	0.017	0.206	0.107	0.022	0.220	0.116	0.024	0.184	0.097	0.020	0.014	0.007	0.001
	High	0.149	0.080	0.017	0.194	0.104	0.021	0.208	0.112	0.023	0.174	0.094	0.019	0.013	0.007	0.001
Derivatives transactions on exchanges																
Total	Low	1.165	0.770	0.304	1.175	0.779	0.309	2.279	1.510	0.598	0.784	0.505	0.191	0.037	0.024	0.009
	Medium	0.790	0.583	0.267	0.792	0.588	0.271	1.538	1.139	0.524	0.559	0.392	0.169	0.026	0.018	0.008
	High	0.415	0.311	0.229	0.410	0.307	0.232	0.797	0.598	0.450	0.334	0.250	0.146	0.015	0.011	0.007
OTC transactions																
Total	Low	0.862	0.575	0.230	1.667	1.111	0.445	0.604	0.403	0.161	1.142	0.762	0.305	0.037	0.024	0.010
	Medium	0.575	0.431	0.201	1.111	0.834	0.389	0.403	0.302	0.141	0.762	0.571	0.267	0.024	0.018	0.009
	High	0.287	0.216	0.172	0.556	0.417	0.333	0.201	0.151	0.121	0.381	0.286	0.228	0.012	0.009	0.007
All transactions																
	Low	2.193	1.430	0.551	3.057	2.000	0.776	3.115	2.031	0.784	2.121	1.365	0.516	0.088	0.056	0.020
	Medium	1.523	1.097	0.485	2.109	1.528	0.682	2.160	1.557	0.690	1.505	1.060	0.456	0.064	0.044	0.018
	High	0.852	0.607	0.418	1.160	0.828	0.587	1.206	0.861	0.594	0.888	0.630	0.394	0.040	0.027	0.016

It is interesting to note that the estimated revenues of a general FTT at the low rate of 0.01% come close to the hypothetical revenues from a VAT on financial services. In Europe, e.g., FTT revenues at a rate of 0.01% are estimated to lie between 0.59% and 0.78% of GDP (table 10). If financial services were not exempt from VAT the latter would yield roughly 0.7% of GDP (this estimate implies a share of the financial sector in overall value added of 3.5% and an average VAT rate of 20% – see *Huizinga*, 2002). Hence, the introduction of a general FTT would roughly compensate for the – distorting – exemption of financial services from VAT. In addition, a general FTT would affect the (relative) profitability of different types of activities within the financial sector. Financing, insurance and risk transformation would practically remain unaffected by a FTT whereas short-term trading would become more costly (in particular derivatives transactions).

Table A8 in the annex compares our estimates of the FTT revenues from foreign exchange transactions to the extant estimates of the revenue potential of a currency transaction tax. If one takes into account the different size of the tax base, i.e., of transaction volumes in foreign exchange markets in different years, as well as the different assumptions concerning tax rates

and the reduction of trading volumes, then one can conclude that the revenue estimates are consistent. The main reason why our estimates are significantly higher than those of former studies is related to the different currency transaction volumes on which the estimates are based on.

6. Feasibility and effects of a general financial transaction tax

In this section we sketch at first some guidelines for the implementation of a general FTT. These guidelines shall address questions like the following. Which transactions should be subject to the FTT? In which steps could such a tax be implemented, in particular within the EU? How relevant might the effects of a circumvention of the FTT be? Finally, we discuss some probable effects of the implementation of a general FTT on trading volumes and price volatility of different types of financial instruments.

6.1 Stages of the implementation of a general FTT

The most important motive for proposing a general and uniform FTT lies in dampening excessive liquidity in financial markets and in mitigating the related overshooting of asset prices, in particular of exchange rates, stock prices, interest rates, and commodities prices. Hence, a general FTT should hamper specifically those transactions which speculate on short-term movements of asset prices in a destabilizing manner (i.e., unrelated to fundamentals like transactions based on technical trading). To put it "upside down": an FTT should not tax those transactions which are simply the financial equivalent to "real-world-transactions" like payments related to transactions in the goods or labor markets.

Following a pragmatic approach in line with this reasoning, we would propose to make the following transactions subject to a general and uniform FTT:

- All spot and derivatives transactions on organized exchanges, e.g., trades of stocks and interest rate securities, as well as trades of futures and options related to stocks, interest rate securities, currencies and commodities.
- Those OTC transactions which are directly related to asset prices, in particular to exchange rates and interest rates, e.g., spot currency transactions as well as trades of foreign exchange derivatives and (single currency) interest rate derivatives.

The first group of transactions is clearly defined. The second group covers all transactions reported by the "Triennial Central Bank Survey" plus OTC spot transactions of interest rate securities and stocks. Since the latter two types of transactions are quantitatively not important it would be sufficient to tax all transactions covered by the BIS survey. For a detailed definition of all these transactions see *BIS,* 2007.

This proposal implies that all transactions between customers (households and enterprises) and financial institutions (in particular banks, but also insurance companies or brokerage firms) would not be subject to the FTT. E.g., if a private persons gives an order to her broker to by or sell stocks or a futures contracts only the transaction on the exchange would be taxed (i.e., the respective settlement payments) but not the payment between the customer and the broker.

Taxes on all transactions are collected by the exchanges themselves. At the same time, the exchanges debit the buyer and the seller of each transaction with 50% of the tax. The whole procedure should be easily organized due to the electronic settlement systems used on all important exchanges.

The collection of the tax on OTC transactions should also make use of electronic trading platforms and settlement systems. Even though it will certainly be more difficult to organize the tax collection in the case of OTC transactions as compared to transactions on exchanges, several studies about the feasibility of a Tobin tax have shown that the related technical problems can be solved. Hence, for the purpose of this study it is sufficient to refer to the very detailed concepts how to implement a currency transaction tax in practice (see *Spahn*, 2002; *Jetin – Denis*, 2005).

Any plan to implement a general FTT must take into account the technical as well as the political obstacles to the realization of this project. As regards the technical issues, it is clear that a tax on transactions on organized exchanges can be realized much easier than a tax on OTC transactions. Out of the latter, transactions involving only a single currency are more easily taxed than foreign exchange transactions. As regards the political issues, it is clear that the willingness to implement such a tax will differ considerably between countries and regions.

It follows from this reasoning that a general taxation of financial transactions in all major economies might only be the final stage in the process of implementing an FTT. The first stage could be the implementation of a tax levied only on spot and derivatives transactions on organized exchanges in some major economies. E.g., such a tax could be implemented in the EU or in major EU economies. In fact, it would be sufficient if only the UK and Germany implemented such a tax (almost 99% of all spot and derivatives transactions on exchanges are carried out in these two countries, of which roughly three quarters take place in the UK and one quarter in Germany).

This extreme concentration of transactions on exchanges in Europe (only 6% are spot transactions, 94% refer to futures and options) clearly shows that network externalities of well-established market places are the most important factor for their success. This in turn implies that an FTT of 0.05% or even only 0.01% will not induce any considerable "emigration" of transactions.

There are two additional reasons for this presumption. First, the most important "blue chip stocks" of German and British corporations will always be traded at their "home" stock exchange, and so will derivatives related to these stocks (this argument applies also to derivatives instruments related to "national" stock indices like DAX or FTSE). The same reasoning holds true for standard derivatives instruments related to interest rate securities like the Euro Schatz future, the Euro BOBL future and the Euro BUND future in the case of Germany. Second, the market place which might be the most challenging competitor to London and Frankfurt, namely Chicago (to a lesser extent also New York), operates in a (very) different time zone.

Based on the experience with an FTT levied only on transactions on organized exchanges one could include in the second stage all OTC transactions within the Euro area (or in some major

EMU member countries) which involve no other currencies, i.e., primarily euro interest rate derivatives. The third stage would then include also spot and derivatives transactions in the foreign exchange market.

OTC transactions are also highly concentrated in relatively few countries, though to a lesser extent than transactions on exchanges. E.g., in Europe (EU27 plus Norway and Switzerland), three quarters of all OTC transactions were carried out in the UK, France and Germany, almost 80% of these transactions took place in the UK markets. Hence, network externalities are of great importance for attracting financial transactions also in the case of OTC trading. Hence, it does not seem probable that a considerable part of OTC trading would migrate to other "FTT-free" marketplaces within the European time zone. For a more detailed discussion of the related issues see *Kenen*, 1996; *Garber*, 1996; *Spahn*, 2002; *Jetin – Denys*, 2005; *Stadler – Pock*, 2006: all these studies conclude that an FTT on OTC transactions, in particular a currency transaction tax, is feasible, provided that tax rates are low and that a political consensus can be reached among major countries.

6.2 Some major economic effects of a general FTT

Since the uniform tax rate of a general FTT refers to the notional value of the respective transaction, the FTT will hamper primarily very short-term trading of derivative instruments, in particular, intraday trading of derivatives with high leverage ratios (i.e., short-term speculation). By contrast, spot transactions of stocks and interest rate securities as well as derivatives transactions aimed at hedging open positions from goods markets activities (i.e., future export earnings in a foreign currency) will not be markedly affected by an FTT between 0.1% and 0.01%. This is so because the time horizon of these types of transactions is much longer than that of (intraday) speculation.

As regards the used trading technique, a general and uniform FTT will dampen specifically technical trading based on intraday data. As survey studies show, there is a clear tendency that the shorter is the time horizon of a speculative transaction the more it is based on technical analysis (see, e.g., *Menkhoff – Taylor*, forthcoming). This finding is confirmed by the literature about "day trading" for practitioners (*Deel*, 2000; *Velez – Capra*, 2000). At the same time, technical trading strengthens short-term price runs which accumulate to medium-term and long-term trends. These "bull markets" and "bear markets" are particularly pronounced in the stock market, the foreign exchange market and in the commodities markets.

Since the FTT should be at first implemented with respect to spot and derivatives transactions on organized exchanges it would specifically hamper intraday speculation by amateurs ("dentists and doctors") based on technical models.

One can therefore conclude that a general FTT with a low and uniform tax rate will most probably reduce excessive liquidity in financial markets and, hence, will mitigate the instability of asset prices. If an FTT contributes to reducing the extent of overshooting of exchange rates, stock prices, interest rates, and commodities prices, it will be beneficial not only for those countries which implement such a tax but for the global economy as a whole. This presumption might also concern the prehistory of financial crises. Certainly, a FTT will not prevent the outbreak of financial crises or other global shocks like oil price shocks. However, a

FTT might mitigate the depth of these crises insofar as such a tax will restrict the extent of asset price overshooting which usually precedes the outbreak of financial crises or other global shocks (*Schulmeister*, 2000).

This study focuses on the original motivation of Keynes and Tobin to propose the taxation of financial transactions, namely, to mitigate the misalignment of speculative prices. Hence, we do not deal with the issue of how the potential revenues of a general FTT could be used. However, we would like to stress that the size of the revenues is substantial, even if the tax rate were to lie only between 0.05% and 0.01%. E.g., even if the FTT would only be levied on transactions on major exchanges in the EU (in particular in Germany and the UK), revenues would lie between 0.2% and 0.8% of nominal GDP of EU27 (plus Norway and Switzerland), amounting to between 35.4 and $ 118.6 billion (tables 10 and A7). If an FTT would be fully implemented the potential revenues for tax rates between 0.05% and 0.01% would be roughly three times higher (between 0.6% and 2.0% of GDP of EU27 plus Norway and Switzerland). Hence, the amount of potential revenues from a general FTT are so big that they could substantially finance truly great projects like a "Global Marshall Plan" or projects to improve the infrastructure within the EU, in particular with respect to the challenges of climate change.

When discussing a currency transaction tax as well as a general FTT as a potential resource of financing the EU budget, *Richter* (2006) correctly notes that most revenues would stem from transactions on the London market place. He concludes from the extreme regional concentration of financial transactions that an FTT is not appropriate as means of financing the EU budget because such a tax would violate the principle of "fair sharing of burdens across Member States".

This argument rejects in general an FTT as a source of financing supranational projects or institutions as financial transactions are in general highly concentrated on certain market places. We do not subscribe to this argument for the following reason. Let us assume that an FTT on all transactions on exchanges in the EU27 is implemented ("stage 1" in the process towards the implementation of a general FTT). In this case, roughly three quarters of revenues would stem from transactions on the London market place and one quarter from the EUREX in Frankfurt. However, the tax will effectively be paid by all actors who make use of the exchanges in London and Frankfurt due to the network externalities provided by these markets. These actors comprise professional and amateur traders from all over Europe (and to a lesser extent also from non-European countries). If we assume that trading activities are roughly proportionate to the overall economic performance (i.e., nominal GDP) then an FTT might well be in line with the principle of a fair sharing of the tax burden. To put it differently: The fact that most of the tax revenues would be collected in the UK and Germany does not mean that only these countries carry the burden of the tax.

Of course, for providing the EU as a whole with such efficient market places as London and Frankfurt, the UK and Germany should get some fixed share of tax revenues (not the least also for political reasons). However, the other part of the revenues could be used to finance supranational projects at the EU level or at the global level.

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Annex

Table A1: Taxes on financial transactions in selected countries

	Capital duty			Transfer tax			Tax revenues 2005 financial transaction taxes Mio. € (% of GDP)
	Tax rate (%)	Tax base	Tax revenues Mio. € (% of GDP)	Tax rate (%)	Tax base	Tax revenues Mio. € (% of GDP)	
Austria	1	Contributions of capital to an Austrian company	81 (0.03)	Abolished in 2000 (0.15)	–	–	81 (0.03)
Belgium	Abolished in 2006 (0.5)	–	–	0.5 to 1.7 per 1,000 € worth of securities (max. 500 € per transaction) 0.6	Shares, bonds and other securities Physical delivery of bearer securities *Trade in short-term commercial papers and securities issued upon formation of a company or an investment fund non taxable*	147 (0.05) 10 (0.003)	157 (0.053)
Denmark	Abolished in 1993	–	–	Abolished in 1999 (0.5)	–	–	–
Finland	–	–	–	1.6	Shares and other securities if transfer is not made through stock exchange	554 (0.4)	554 (0.4)
France	–	–	–	0.3 for transactions up to 153,000 € 0.15 on the value exceeding 153.000 € (max. 610 € per transaction)	Sale of securities on stock exchange or OTC *SME and new stock exchange market are exempted*	215 (0.01)	215 (0.01)
Germany	Abolished in 1992 (1)	–	–	Abolished in 1991 (0.01 to 0.25)	–	–	–
Greece	1	Contribution to share capital on formation of a company	1,767 (0.8)[2])	0.15 5	Shares listed on Athens Stock Exchange or any other recognized stock exchange in the world non-listed shares	See capital duty	1,767 (0.8)

Ireland	Abolished in 2005 (0.5)	–	–	1 0.5	Shares registered in Ireland shares and securities of foreign registered companies	2,585 (1.6)[3])	2,585 (1.6)[3])[j]
Italy	Abolished in 2000	–	–	0.009 to 0.14	Shares, bonds and similar securities *Transfers of securities through a recognized stock exchange are exempt*	5,427 (0.4)	5,427 (0.4)
Luxembourg	1	Contribution of capital to a company or branch upon formation or upon subsequent increase of the subscribed capital	164 (0.6)	–	–	–	164 (0.6)
Netherlands	Abolished in 2006 (0.55)	–	–	Abolished in 1990	–	–	–
Portugal	0.4	Capital contributions to capital companies upon incorporation or any subsequent capital or equity increase	11 (0.0)	–	–	–	11 (0.0)
Spain	1	Contribution of capital to a company or a branch upon formation or subsequent increase of the subscribed capital	15,832 (1.7)[5])	Abolished in 1988	–	–	15,832 (1.7)[5])
Sweden	Abolished in 1995	–	–	Abolished in 1991	–	–	–
United Kingdom	Abolished in 1998	–	–	0.5	Shares and securities *Transfers of most securities are exempt*	9,910 mio. British Pounds (0.8)	9,910 mio. British Pounds (0.8)
Bulgaria	–	–	–	–	–	–	–
Cyprus	CYP 60 plus 0.6	Share capital	n.a.	0.6 (Individuals) 1 (Companies)	Transactions that take place in the Cyprus Stock Exchange	n.a.	n.a.
Czech Republic	–	–	–	–	–	–	–
Estonia	–	–	–	–	–	–	–
Hungary	–	–	–	–	–	–	–
Latvia	–	–	–	–	–	–	–
Lithuania	–	–	–	–	–	–	–
Malta	–	–	–	2	Marketable securities; transfers of securities listed on the Malta Stock Exchange are exempted	n.a.	n.a.

Poland	0.5	Initial capital contribution to a newly registered company and on any additional contribution to the company's capital	n.a.	1	Shares, bonds and other securities if underlying rights are exercised in Poland	n.a.	n.a.
Romania	–	–	–	–	–	–	–
Slovak Republic	–	–	–	–	–	–	–
Slovenia	–	–	–	–	–	–	–
Switzerland	1	Issuance of shares and other participation rights	431 mio. Swiss Francs (0.09)	0.15 0.3	Domestic securities Foreign securities Transfers are taxable if one of the parties is a security broker with traded securities exceeding a book value of CHF 10 million	1,627 mio. Swiss Francs (0.4)	2,058 mio. Swiss Francs (0.49)
Canada	–	–	–	–	–	–	–
United States	–[1])	–	–	–	Abolished in 1966[1])	–	–
Australia	–	–	–	–	–[1])	–	–
Japan	0.7 (min. 30,000 Yen)	Registration of stock corporations and increase of capital	1,169,000 mio. Yen (0.2)	Abolished in 1999	–	–	1,169,000 mio. Yen (0.2)
Hong Kong	–	–	n.a.	0.1	Stock transactions	n.a.	n.a.
Singapore	–	–	–	Rate varies with type of document and transaction value	Stocks and shares	n.a.	n.a.
Taiwan	–	–	–	0.1 0.3	Bonds and other securities stocks	n.a.	n.a.
China	–	–	–	0.3	Securities	n.a.	n.a.

Sources: IBFD, OECD. – [1]) No federal taxes; a number of states impose initial registration and/or annual capital taxes on corporations based on share capital or number of shares issued (capital duty) or taxes on the transfer of corporate stock (transfer tax). – [2]) Capital duty plus transfer tax. – [3]) Including capital duty and transfer taxes on all kinds of property. – [4]) Including taxes on immovable property. – [5]) All taxes on property transactions.

Table A2: Exchanges/countries and instruments covered by WFE data

Table 1: Financial markets and instruments	Spot markets				Derivatives markets			
	Coverage 2006		Coverage 1991		Coverage 2006		Coverage 2002	
	Stocks	Bonds	Stocks	Bonds	Stock index futures [3]	Short-term interest rate futures[3]	Stock index futures[3]	Short-term interest rate futures[3]
EU								
Athens Derivatives Exchange					X		X	
Athens Exchange	X	X	X					
BME Spanish Exchanges	X	X			X		X	
Borsa Italiana	X	X	X		X		X	
Budapest SE	X	X			X	X	X	
Cyprus SE	X	X						
Deutsche Börse	X	X	X	X				
Eurex[1])					X	X	X	X
Euronext.liffe					X	X		
Euronext							X	X
Euronext Amsterdam	X	X	X					
Euronext Brussels	X	X	X	X				
Euronext Lisbon	X	X	X	X				
Euronext Paris	X	X						
Irish SE	X	X	X	X				
Ljubljana SE	X	X						
London SE	X	X						
London Metal Exchange (LME)	X	X	X	X				
Luxembourg SE	X	X	X	X				
Malta SE	X	X						
OMX[2])	X	X			X			
OMX Copenhagen	X		X	X				
OMX Helsinki	X		X	X				
OMX Stockholm	X		X	X				
Copenhagen Stock Exchange								
Helsinki Exchanges								
Stockholm							X	
Stockholmsboersen								X
Warsaw SE	X	X	X		X		X	
Wiener Börse	X	X	X	X	X		X	
Other Europe								
Istanbul SE	X	X	X					
Turkish Derivatives Exchange								
Oslo Børs	X	X	X	X	X		X	
RTS Stock Exchange							X	
Swiss Exchange	X	X	X					

[1]) Euronext is an integrated exchange covering Euronext Amsterdam, Brussels, Lisbon and Paris (since 2001). – [2]) OMX is an integrated exchange covering the exchanges in Copenhagen, Helsinki, Stockholm, Tallin, Riga and Vilnius (since 2004). – [3]) The coverage of exchanges is widest with respect to these instruments. On many of these exchanges also the following derivatives are traded and included in the WFE data set: Stock options and futures, stock index options, short-term interest rate options, long-term interest rate options and futures, currency options and futures, commodity options and futures.

Table A2 (cont): Exchanges/countries and instruments covered by WFE data

	Spot markets				Derivatives markets			
	Coverage 2006		Coverage 1991		Coverage 2006		Coverage 2002	
	Stocks	Bonds	Stocks	Bonds	Stock index futures[3])	Short-term interest rate futures[3])	Stock index futures[3])	Short-term interest rate futures[3])
North America								
American SE	X		X					
Nasdaq	X		X					
NYSE	X	X	X	X				
TSX Group (Canada)	X	X	X					
Bourse de Montreal					X	X	X	X
Chicago Board of Trade (CBOT) [4])								
Chicago Board Options Exchange (CBOE)					X			
Chicago Mercantile Exchange (CME)						X	X	X
New York Board of Trade (NYBOT) [4])								
New York Mercantile Exchange (NYMEX) [4])								
Asia - Pacific								
Australian SE	X	X	X	X	X	X	X	
BSE, The SE Mumbai							X	
Bombay SE	X	X						
Bursa Malaysia	X	X	X	X	X	X		
Colombo SE	X	X	X					
Hong Kong Exchanges	X	X	X	X	X	X	X	X
Jakarta SE	X		X					
Korea Exchange	X	X	X	X	X	X	X	
Korea Futures Exchange							X	X
National Stock Exchange India	X	X						
New Zealand Exchange	X	X	X					
National Stock Exchange India					X		X	
Osaka SE	X	X	X	X	X		X	
Philippine SE	X		X					
Shanghai SE	X	X						
Shenzen SE	X	X						
Singapore Exchange	X	X	X	X	X	X		
TAIFEX					X	X	X	
Thailand Futures Exchange (TFEX)					X			
TIFFE								X
Taiwan SE Corp.	X	X	X	X				
Thailand SE	X	X	X	X				
Tokyo SE	X	X	X	X	X		X	
Tokyo Financial Exchange						X		
Others								
Bermuda SE	X							
BM&F					X	X		
Buenos Aires SE	X	X	X	X				
Cairo & Alexandria SE	X	X						
Colombia SE	X	X						
JSE	X		X					
Lima SE	X	X	X					
Mauritius SE	X	X						
MexDer					X	X	X	X
Mexican Exchange	X	X	X	X				
Santiago SE	X	X	X	X				
Sao Paulo SE	X	X	X					
Tehran SE	X		X					
Tel-Aviv SE	X	X	X	X	X			
JSE					X		X	

[3]) The coverage of exchanges is widest with respect to these instruments. On many of these exchanges also the following derivatives are traded and included in the WFE data set: Stock options and futures, stock index options, short-term interest rate options, long-term interest rate options and futures, currency options and futures, commodity options and futures. – [4]) Derivatives data up to 2005.

Table A3: Regions/countries and instruments covered by BIS data

Types of market	Types of transaction/instrument	Data coverage
Spot market	Foreign exchange	Average daily transactions over the month of April in 1989, 1992, 1995, 1998, 2001, 2007, 2004, and 2007 in 54
Derivatives market		
Exchanges	Exchange traded instruments: Stock index futures and options Interest futures and options Foreign exchange futures and options	Aggregate data available since 1986 for the following regions: Europe, North America, Asia and Pacific, Other.
OTC	OTC-traded insturments: Foreign exchange contracts Outright forwards and foreign exchange swaps[1]) Currency swaps Options Other Interest rate contracts Forwardrate agreement Swaps Options Other	Average daily transactions over the month of April in 1998, 2001, 2004, and 2007 in 54 Countries (2007). The respective data are collected by the „Triennial Central Bank Survey“, organized BIS.

[1]) These transactions are also included in the overall foreign exchange market turnover and, hence, are also available for April 1989, 1992, and 1995.

Table A4: Transaction costs and margin requirements of selected futures contracts[1])

	Exchange	Contract size	Price of underlying asset/ index in $	Notional Value in $	Transaction costs Abs. in $	Transaction costs in % of notional value	Initial Margins (overnight) Abs. in $	Initial Margins (overnight) in % of notional value	Leverage factor
US markets									
Stock index contracts									
S&P 500	CME	250 *Index	1500	375,000	6	0.0016	19688	5.250	19.0
Interest contracts									
Eurodollar (3 month)	CME	1,000,000 Dollar deposit	96	957,000	6	0.0006	743	0.08	1288.0
T-Bills (90 day)	CME	1,000,000 T-Bills	96	958,000	6	0.0006	405	0.04	2365.4
T-Notes (2y)	CBOT	200,000 T-Notes	104	208,200	6	0.0029	878	0.42	237.1
T-Notes (5y)	CBOT	100,000 T-Notes	108	108,200	6	0.0055	878	0.81	123.2
Currency contracts									
British Pound	IMM	62,500 Pfund	2.08	130,000	6	0.0046	1823	1.40	71.3
Eurodollar (3 month)	IMM	125,000 Dollar	1.00	125,000	6	0.0048	2025	1.62	61.7
Yen	IMM	12,500,000 Yen	0.01	114,679	6	0.0052	4954	4.32	23.1
Commodities									
Corn	CBOT	5,000 Bushels	3.09	15,450	6	0.0388	1080	6.99	14.3
Wheat	CBOT	5,000 Bushels	7.60	38,000	6	0.0158	2025	5.33	18.8
Soyabean	CBOT	5,000 Bushels	10.40	52,000	6	0.0115	2700	5.19	19.3
Pork bellies	CME	40,000 Pounds	0.88	35,200	6	0.0170	1620	4.60	21.7
Cocoa	NYBOT	10 Tons	1880	18,800	6	0.0319	1120	5.96	16.8
Coffee	NYBOT	37,500 Pounds	1.25	46,875	6	0.0128	2520	5.38	18.6
Cotton	NYBOT	50,000 Pounds	0.56	28,000	6	0.0214	1260	4.50	22.2
Gold	NYMEX	100 Ounces	828	82,800	6	0.0072	3375	4.08	24.5
Crude oil	NYMEX	1,000 Barrels	95	95,000	6	0.0063	5434	5.72	17.5
Euro aera markets (EUREX)									
			in €	in €	in €		in €		
Stock index contracts									
DAX Futures	EUREX	25 *Index	8,000	200,000	6	0.0030	14900	7.45	13.4
Interest contracts									
Euro Schatz	EUREX	100,000 Euro	103.50	103,500	6	0.0058	500	0.48	207.0
Euro BOBL	EUREX	100,000 Euro	108.00	108,000	6	0.0056	1000	0.93	108.0
Euro BUND	EUREX	100,000 Euro	114.00	114,000	6	0.0053	1600	1.40	71.3

[1]) As of mid November 2007 (rounded to "simple" numbers in the case of S&P 500 index and DAX index).

Table A5: Hypothetical transaction tax receipts in some European countries in bill. $

		Austria			France			Italy			Belgium			Netherlands		
Tax rate / Reduction in transaction volume		0.1	0.05	0.01	0.1	0.05	0.01	0.1	0.05	0.01	0.1	0.05	0.01	0.1	0.05	0.01
Spot transactions on exchanges																
Stocks	Low	0.1	0.0	0.0	2.1	1.1	0.2	1.5	0.8	0.2	0.1	0.0	0.0	1.3	0.7	0.1
	Medium	0.1	0.0	0.0	2.0	1.1	0.2	1.4	0.8	0.2	0.1	0.0	0.0	1.3	0.7	0.1
	High	0.1	0.0	0.0	1.9	1.0	0.2	1.4	0.7	0.2	0.1	0.0	0.0	1.2	0.7	0.1
Bonds	Low	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.3	0.2	0.0
	Medium	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.3	0.2	0.0
	High	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.3	0.2	0.0
Total	Low	0.1	0.0	0.0	2.2	1.1	0.2	1.7	0.8	0.2	0.1	0.0	0.0	1.7	0.9	0.2
	Medium	0.1	0.0	0.0	2.1	1.1	0.2	1.6	0.8	0.2	0.1	0.0	0.0	1.6	0.8	0.2
	High	0.1	0.0	0.0	1.9	1.1	0.2	1.5	0.8	0.2	0.1	0.0	0.0	1.5	0.8	0.2
Derivatives transactions on exchanges																
Total	Low	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	Medium	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	High	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
OTC transactions																
Total	Low	2.9	1.9	0.8	25.1	16.8	6.7	6.6	4.4	1.8	6.0	4.0	1.6	7.2	4.8	1.9
	Medium	1.9	1.4	0.7	16.8	12.6	5.9	4.4	3.3	1.5	4.0	3.0	1.4	4.8	3.6	1.7
	High	1.0	0.7	0.6	8.4	6.3	5.0	2.2	1.7	1.3	2.0	1.5	1.2	2.4	1.8	1.4
All transactions																
	Low	3.0	2.0	0.8	27.3	17.9	6.9	8.9	5.6	2.1	6.1	4.0	1.6	8.9	5.7	2.1
	Medium	2.0	1.5	0.7	18.8	13.7	6.1	6.4	4.4	1.8	4.1	3.0	1.4	6.4	4.5	1.9
	High	1.0	0.8	0.6	10.3	7.3	5.2	4.0	2.7	1.6	2.1	1.5	1.2	3.9	2.6	1.6

Table A6: Hypothetical transaction tax receipts in Germany and United Kingdom in bill. $

		Germany			United Kingdom		
	Tax rate / Reduction in transaction volume	0.1	0.05	0.01	0.1	0.05	0.01
Spot transactions on exchanges							
Stocks	Low	2.6	1.3	0.3	7.2	3.7	0.8
	Medium	2.5	1.3	0.3	6.8	3.6	0.8
	High	2.3	1.3	0.3	6.4	3.5	0.7
Bonds	Low	0.3	0.1	0.0	3.2	1.7	0.3
	Medium	0.3	0.1	0.0	3.1	1.6	0.3
	High	0.3	0.1	0.0	3.0	1.6	0.3
Total	Low	2.9	1.5	0.3	10.4	5.3	1.1
	Medium	2.7	1.4	0.3	10.0	5.2	1.1
	High	2.6	1.4	0.3	9.4	5.0	1.0
Derivatives transactions on exchanges							
Stock index	Low	11.7	7.3	2.6	4.5	2.8	1.0
	Medium	8.8	5.9	2.3	3.3	2.2	0.9
	High	5.9	4.4	2.1	2.2	1.7	0.8
Interest rates	Low	31.4	20.9	8.4	135.2	90.1	36.0
	Medium	20.9	15.7	7.3	90.1	67.6	31.5
	High	10.5	7.9	6.3	45.1	33.8	27.0
Commodities	Low	0.0	0.0	0.0	0.0	0.0	0.0
	Medium	0.0	0.0	0.0	0.0	0.0	0.0
	High	0.0	0.0	0.0	0.0	0.0	0.0
Total	Low	43.1	28.3	11.0	139.7	92.9	37.1
	Medium	29.7	21.6	9.7	93.5	69.8	32.4
	High	16.3	12.2	8.3	47.3	35.5	27.8
OTC transactions							
Total	Low	16.3	10.9	4.4	151.5	101.0	40.4
	Medium	10.9	8.2	3.8	101.0	75.7	35.3
	High	5.4	4.1	3.3	50.5	37.9	30.3
All transactions							
	Low	62.3	40.6	15.7	301.5	199.2	78.5
	Medium	43.3	31.2	13.8	204.4	150.8	68.9
	High	24.4	17.7	11.9	107.2	78.4	59.2

Table A7: Hypothetical transaction tax receipts in the global economy in bill. $

		World			Europe			North America			Asia and Pacific			Other		
	Tax rate / Reduction in transaction volume	0.1	0.05	0.01	0.1	0.05	0.01	0.1	0.05	0.01	0.1	0.05	0.01	0.1	0.05	0.01
Spot transactions on exchanges																
Stocks	Low	66.3	33.9	7.0	20.3	10.4	2.1	33.7	17.2	3.5	11.5	5.9	1.2	0.8	0.4	0.1
	Medium	62.8	33.2	7.0	19.3	10.2	2.1	31.9	16.9	3.5	10.9	5.7	1.2	0.8	0.4	0.1
	High	59.4	32.1	6.6	18.2	9.8	2.0	30.2	16.3	3.4	10.3	5.6	1.1	0.7	0.4	0.1
Bonds	Low	13.6	7.0	1.4	12.3	6.3	1.3	0.0	0.0	0.0	0.4	0.2	0.0	0.9	0.5	0.1
	Medium	13.3	6.8	1.4	12.1	6.2	1.3	0.0	0.0	0.0	0.4	0.2	0.0	0.9	0.5	0.1
	High	12.6	6.6	1.4	11.4	6.0	1.2	0.0	0.0	0.0	0.4	0.2	0.0	0.9	0.4	0.1
Total	Low	80.0	40.9	8.4	32.7	16.7	3.4	33.7	17.2	3.5	11.9	6.1	1.2	1.7	0.9	0.2
	Medium	76.2	40.0	8.4	31.3	16.3	3.4	31.9	16.9	3.5	11.2	5.9	1.2	1.7	0.9	0.2
	High	72.0	38.7	8.0	29.6	15.8	3.3	30.2	16.3	3.4	10.6	5.7	1.2	1.6	0.8	0.2
Derivatives transactions on exchanges																
Total	Low	562.3	371.6	146.7	179.0	118.6	47.0	330.8	219.1	86.8	47.9	30.9	11.7	4.6	3.0	1.1
	Medium	381.3	281.1	128.6	120.7	89.5	41.2	223.2	165.4	76.1	34.2	24.0	10.3	3.2	2.3	1.0
	High	200.4	150.3	110.5	62.4	46.8	35.4	115.7	86.8	65.3	20.4	15.3	8.9	1.8	1.4	0.9
OTC transactions																
Total	Low	415.9	277.3	110.9	253.9	169.3	67.7	87.6	58.4	23.4	69.8	46.6	18.6	4.5	3.0	1.2
	Medium	277.3	208.0	97.1	169.3	127.0	59.2	58.4	43.8	20.4	46.6	34.9	16.3	3.0	2.3	1.1
	High	138.6	104.0	83.2	84.6	63.5	50.8	29.2	21.9	17.5	23.3	17.5	14.0	1.5	1.1	0.9
All transactions																
	Low	1058.1	689.8	266.0	465.5	304.6	118.2	452.1	294.8	113.8	129.7	83.5	31.6	10.9	6.9	2.5
	Medium	734.8	529.1	234.0	321.3	232.8	103.9	313.6	226.1	100.1	92.0	64.8	27.8	7.9	5.4	2.2
	High	411.0	293.0	201.7	176.7	126.1	89.4	175.1	125.0	86.2	54.3	38.5	24.1	4.9	3.4	1.9

Table A8: Estimates of the revenue potential of a currency transaction tax

Author	Year of daily turnover	Daily turnover (US-$ billion)	Elasticity[1])	Reduction of volume	Tax rates	Revenues (US-$ billion)
Worldwide						
Kapoor (2004)	2004	n.a.	n.a.	none	0.005%	10 to 15
Nissanke (2004)	2001	1,210	none	5% to 15%	0.01% 0.02%	30 to 35 17 to 19
Clunies-Ross (2003)	2001	1,210	n.a.	n.a.	0.02%	53
Cassimon (2001)	1998	2,100	none	none	0.01% 0.02%	47.25 94.5
Felix/Sau (1996)	1995	1,210	–0.3 to –1.75	–13% for tax rate 0.05% –49% for tax rate 0.1%	0.05% 0.1% 0.25%	90 to 97 148 180
Kenen (1996)	1995	1,210	n.a.	n.a.	0.05% and 0.025% for banks	90 to 97
Tobin (1996)	1995	1,210	n.a.	–70%	0.1%	50 to 94
Frankel (1996)	1995	1,210	n.a.	–45%	0.1%	176
Belgian Ministry of Finance (2001)	1998	1,500	–0.5 to –1.5	5% to 100% (according to tax rate and elasticity)	0.01% to 1%	19 to 128
Finnish Ministry of Finance (2001)	1998	1,500	–0.5 non financial customers –1 financial customers –1.5 banks	5% to 100% (according to tax rate and elasticity)	0.01% 0.25% 1%	71 102 177
French Ministry of Finance (2000)	1998	1,500	–0.5, –1, –1.5	–67% in central estimate	0.01% to 0.2%	50
Jetin – Denys (2005)	2004	1,900	–0.5, –1	15% to 67%	0.01% 0.1	19 to 31 34 to 125
This study	2006	3,637[2])	–	–15% to –35% –50% to –75% –65% to –85%	0.01% 0.05% 0.1%	50.7 to 67.6 63.4 to169.0 84.5 to 253.4
EU level						
Spahn (2002)	2001	440	none	–15%	0.01% 0.02% with 0.01% for banks	16.6 20.8
Belgian Ministry of Finance (2001)	1998	772.5	–0.55 to –1.75	5% to 100% (according to tax rate and elasticity)	0.01% to 1%	9 to 39
French Ministry of Finance	1998	682	–0.5, –1, –1.5	–67% in central estimate	0.01% to 0.2%	22
Jetin – Denys (2005)	2004	659	–0.5, –1	15% to 67%	0.01% 0.1	6 to 10 10 to 38
This study	2006	2.060 2)	–	–15% to –35% –50% to –75% –65% to –85%	0.01% 0.05% 0.1%	28.6 to 38.1 35.7 to 95.3 47.7 to 143.0

Source: *Jetin – Denys* (2005). – [1]) Elasticity: Sensibility of volume of transactions to the tax rate. – [2]) Including OTC traded currency swaps and options.

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