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The Currency Transaction Tax:
Rate and Revenue Estimates

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Abstract

The Currency Transaction Tax (CTT) is a potential source of independent and stable finance for development and other global projects. What should the tax rate be? How much money would it raise? How would it affect foreign exchange markets?

The CTT is functionally equivalent to the bid-ask spread in foreign exchange markets: both are transaction costs. We estimate by econometric regression the relationship between the spread and transaction volume. We find that a CTT of 0.5 basis points (0.005%) in the major currency markets would reduce transaction volume by 14 percent. Post-CTT spreads and transaction volumes would be well within the range of recent observations and would not be disruptive. A 0.5-basis-point CTT would raise at least US$ 33 billion every year, probably more.

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The Currency Transaction Tax: Rate and Revenue Estimates

The Currency Transaction Tax (CTT) is one of the new mechanisms being considered by governments, international institutions, and others to raise large amounts of independent, global, and stable monies.[1] The new revenues are to be used to finance international development and other projects addressing global issues, such as public health. Each of the new financial mechanisms (described in Table 4 of subsection 3.4) poses the same two questions: is it feasible? (meaning, is it cost-effective?; are there negative side-effects?); and, how much money would it raise? We and others showed elsewhere that the CTT is feasible (subsection 1.2). Here we identify an appropriate CTT rate: high enough to raise lots of money but low enough to avoid changing fundamental market behavior. We also estimate revenues when the CTT is applied either unilaterally to a single major currency (the $, €, ¥, or £), or coordinated across several of these currencies.

1 Issues and assumptions

The CTT is a proportional, or percentage, tax on individual foreign exchange transactions, assessed on dealers in the foreign exchange market and collected by financial clearing or settlement systems. Foreign exchange dealers are financial institutions that display bid (buy) and ask (sell) exchange rates, that trade currencies on demand at those or better rates, *and* that have direct access to large-scale gross or netting settlement systems. Dealers trade with other dealers or with non-dealer customers.

The CTT is the conceptual successor to the Tobin Tax (TT). In terms of the mechanics of tax collection (by financial settlement systems) and the tax base (the inter-bank foreign exchange market), the two are identical. The concepts differ by purpose and proposed tax rate. The TT was intended to slow the flow of capital across borders and thereby enhance monetary

[1] More than 50 heads of state and 200 senior ministers, as well as the heads of the United Nations (UN), International Monetary Fund (IMF), World Bank (WB), and World Trade Organization (WTO), attended the UN International Conference on Financing for Development at Monterrey, Mexico, in 2002. The Conference began a search for new sources of development finance, led formally by the UN Department of Economic and Social Affairs (http://www.un.org/esa/ffd/), and informally by more than 40 governments participating in the "Leading Group on Solidarity Levies to Fund Development" (http://www.innovativefinance-oslo.no/).

policy, and to prevent or manage exchange rate crises. The TT rate would be high to change foreign exchange market behavior. By contrast, the CTT is intended to raise money without disrupting the market. The CTT rate would be low.

There are previous estimates of revenues from the CTT or TT, which we summarize in Table 3 of subsection 3.3. A problem in the making of these estimates, including ours, is to predict how much the volume of foreign exchange transactions would contract if a tax were introduced. The previous studies guessed this. We are able to remove the guesswork, as follows.

1.1 Post-CTT transaction volume

Since the CTT is not in place we cannot directly measure the ensuing decline in transaction volume. However, the CTT is equivalent in effect to the bid-ask spread, the difference between bid and ask exchange rates offered by dealers. Both are part of the direct cost of making a foreign exchange transaction. The CTT would affect the foreign exchange market by increasing the width of the spread. So, to anticipate how the CTT would affect the volume of transactions, we can measure how volume usually responds to changes in the spread.

We did this in the \$/¥ dealer spot market for the period 1986 to 2006 (Appendix A). We found that a rise in the spread of one percent leads to a fall in transaction volume of 0.43 percent. In the language of economists, the elasticity of foreign exchange volume with respect to the spread is -0.43.

We investigated the possibility that an increase in the spread due to the tax in one currency-pair market leads to a diversion of transactions to other markets (subsection A.2). There was no indication in the \$/¥ market that a fall in € or £ spreads relative to ¥ spreads is associated with a fall in ¥ volumes.[2]

1.2 Tax evasion

The elasticity is a measure of normal demand for foreign exchange transactions. It does not reflect tax evasion.

Scholars and officials increasingly recognize that avoiding the CTT is difficult and unprofitable when it is collected by large-scale financial and

[2]The coefficient for the € spread was not statistically significant, while that for the £ spread, though marginally significant, had the 'wrong' sign – a decline in the £ spread raised ¥ volume slightly.

foreign exchange settlement systems, such as the Continuous Linked Settlement (CLS) Bank or the ubiquitous SWIFT (see, for example, Landau (2004)). We and others showed this to be true no matter which foreign exchange instrument is used or where or how it is traded (Hillman, Kapoor, and Spratt (2006); Schmidt (1999, 2000, 2001); Spratt (2006)).

Some people worry that many foreign exchange transactions are netted away before being settled and would not be taxed (*e.g.*, Nissanke (2004)), or that unofficial and untaxed new settlement systems would appear (*e.g.*, Landau (2004)). A close reading of the above-cited sources is re-assuring. All financial and foreign exchange settlement systems, whether gross or netting, formal or informal, multilateral or bilateral, track and match individual ('gross') transactions through their operations. All of them, whether on- or off-shore, require an account with the central bank that issues the currency in which the gross transaction is denominated. Finally, all use the same messaging *cum* netting system created and operated centrally by SWIFT. Ultimately, all these settlement systems are overseen and regulated by the central banks. To set up alternative settlement operations would be to go back to the informal proprietary systems and technologies of thirty years ago, something much more costly in money and risk than the CTT.

1.3 Assumptions for estimating revenue

To estimate CTT revenue, we assume:

- dealer spreads reflect the CTT rate fully;
- the CTT is applied to the traditional foreign exchange markets, namely, the spot, outright forward contract, and swap derivative markets;
- there is no tax evasion; and
- the elasticity of foreign exchange volume with respect to the spread is -0.43 for all currency pairs and foreign exchange instruments.

The first two assumptions are conservative. First, it is likely that dealers will pass on some of the tax to their non-dealer customers by widening the retail and non-financial spread. Then the dealer spread may not widen by as much as we assume. Second, if the tax is collected on individual transactions as they are settled, which is the only feasible option, then it would

naturally apply also to the huge non-traditional foreign exchange markets, such as those for over-the-counter derivatives and instruments traded on exchanges.[3]

The last assumption is a simplification: probably the spread elasticity of volume differs by market. This is not important. We checked the sensitivity of our revenue estimates to the volume elasticity by increasing it (in absolute value) to -1 in all markets, and found that the estimates fell by only ten percent.

We will propose a CTT rate of 0.5 basis points (= 0.005%). Our first assumption means that dealer spreads would then widen by one basis point. To see this, recall that the spread contains prices for buying and selling a currency. The exchange rate that appears on foreign exchange paper or agreements to trade is the mid-point between the buying and selling rates. Thus, someone approaching a dealer to buy a currency pays half the spread to the dealer. Similarly, someone who sells a currency pays half the spread. If anyone makes a "round-trip" investment, such as buying a currency this month and selling it next month, the cost of the two transactions is the whole spread. With a CTT in force, traders pay the full tax on each transaction, buying or selling a currency. That is, the cost of each transaction is now half the pre-tax spread plus the CTT. Since traders both buy and sell currencies, the post-tax spread, including buy and sell prices, widens by twice the CTT rate.[4]

Our estimates to follow are based on foreign exchange markets as they were in April, 2007. That was the month of the latest Bank for International Settlements (BIS) survey of foreign exchange activity (BIS, 2007).

2 The CTT rate

The desired CTT rate raises lots of money without disrupting the foreign exchange market. There is no way to identify it precisely. Practically, however, the post-tax spread should be well within the range of recent spread values and transaction volume should not fall too far.

The average and variability of the spread differs considerably across currency markets (Table 1). It is feasible to set a different CTT rate for each currency pair or foreign exchange instrument. However, a uniform rate

[3] This point is made by Hillman et al. (2006, p.24).

[4] Professor Anthony Clunies-Ross of the University of Strathclyde pointed this out to me.

Table 1: Foreign exchange spreads and volumes

Market	Average spread[a]	Standard error[b]	Coefficient of variation[c]	Transaction volume[d]	Volume share
$/€	2.95	1.14	0.30	201,600	0.52
$/¥	3.39	0.95	0.23	95,280	0.25
$/£	2.59	0.83	0.25	86,640	0.23
Wtd.ave.	*2.98*	*1.02*	*0.27*	...	...
Total	...	...	...	*383,520*	*1.00*
€/¥	4	...	...	16,800	
€/£	5	...	...	15,360	
¥/£	9	...	...	2,400[e]	

Source: Olsen Financial Technologies (http://www.olsendata.com) for $ spreads (with respect to the €, ¥, and £); FX Solutions (http://www.fxsol.com) for non-$ spreads; BIS (2007, Table 4) for volumes.

[a] In basis points, averaged over 2005:04 - 2006:03, the last year for which we have data.

[b] A measure of the variability of the spread, in basis points, for the period 2001:1 - 2006:3.

[c] Standard error ÷ average spread for the period 2001:1 - 2006:3. Average spreads for this calculation are for the full five-year period, and thus differ from those shown in the table.

[d] US$ billions per year, based on daily averages reported by the BIS for April 2007 and assuming 240 business days a year.

[e] Estimated as 1.36 × 7.4. The latter figure is from April 2004 (BIS, 2005, Table E.7, p.62, adding together the amounts traded in Japan and the UK). The former figure is the average of the increases in trading volumes of the $/¥ and the €/¥ from 2004 to 2007.

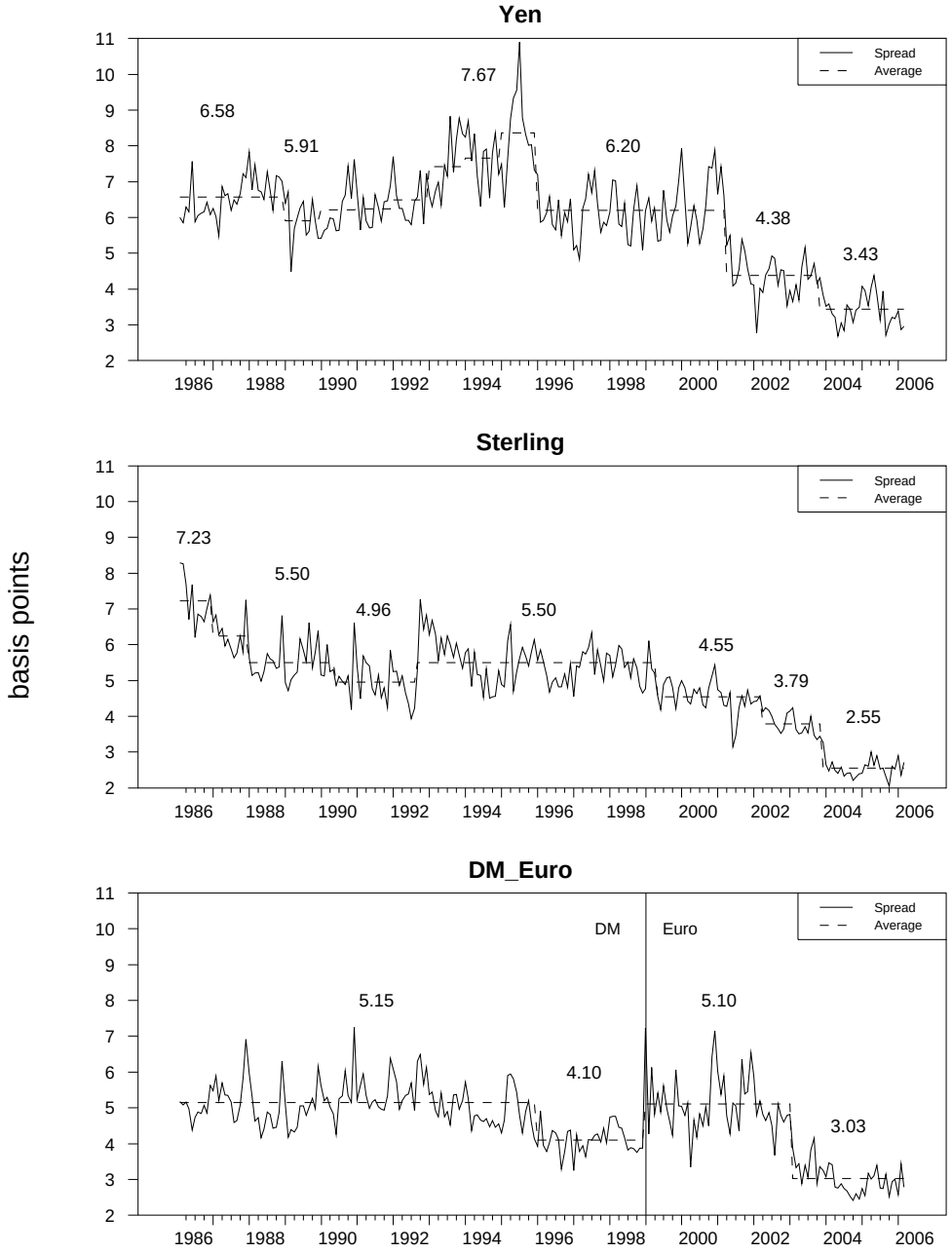
in all markets would avoid unwanted effects on cross-market trading activity.

2.1 Recent spread values

Spreads have been narrowing over the last twenty years, especially recently (Figure 1). They are now at their smallest ever, probably because trading, communication, and settlement technologies have improved and transaction volumes are high.

However, spreads rise substantially and persistently too. In the £/$ market in 1992 the average spread rose by 0.54 basis points, persisting at the higher level for nearly six years. In the DM_€/$ market in January 1999 the spread rose by a full basis point with the introduction of the euro. That

Figure 1: Spreads
(with respect to the US dollar)



increase lasted four years. In the ¥/$ market from 1989 to 1995 the spread rose steadily by 1.76 basis points altogether.

The usual measure of the variability of the spread is the "standard error", the average deviation of the spread from its own average value, in basis points. A characteristic of the standard error is that adding it to and subtracting it from the average spread defines a range which contains about 68% of the historical values of the spread.[5] Spreads outside this range are unusual in a probabilistic sense. In the last five years (2001:1 - 2006:3) the average standard error across the major currency pair markets was a little more than one basis point (Table 1). Dividing the standard error by the average spread defines the "coefficient of variation". In the past five years, the average standard error was 27 percent of the average spread.

So, spreads in the major currency markets commonly fluctuate by up to a basis point and, less commonly, by more. They also increase persistently, by a basis point or more. Then a permanent increase in spreads of one basis point, due to a CTT of 0.5 basis points, would conform to recent experience.

How would a CTT affect the volume of trading and, by extension, market liquidity?

2.2 The CTT and trading volume

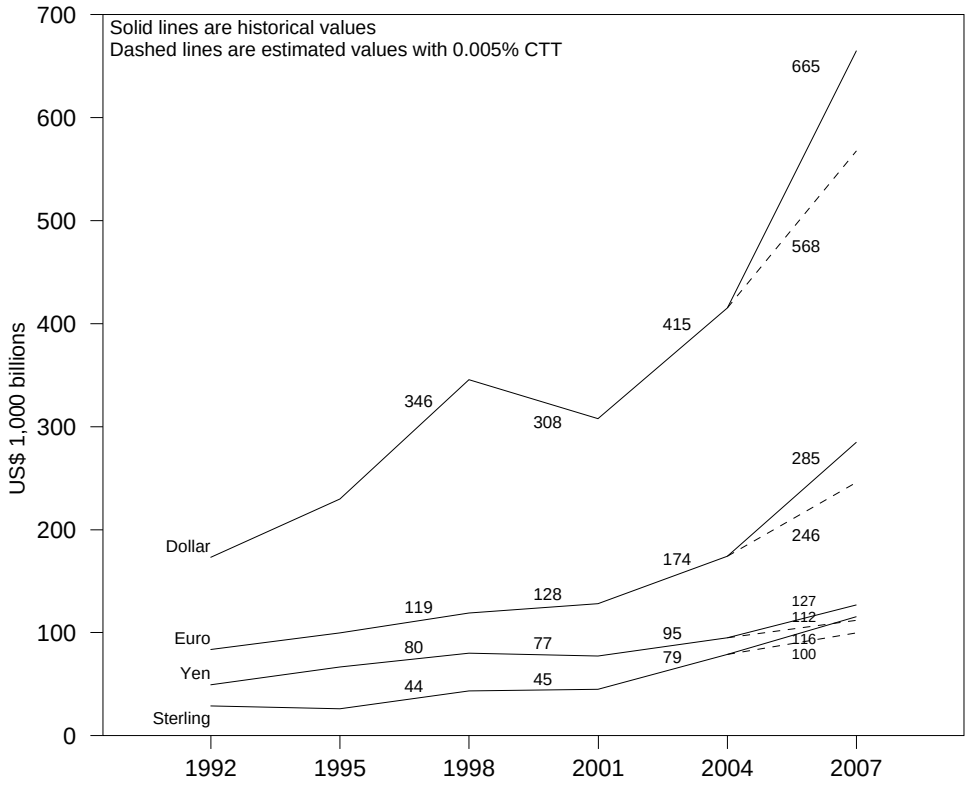
The foreign exchange market is the largest in the world in terms of volume of transactions, and the volume in 2007 was the highest ever (Figure 2). We calculate that a CTT of 0.5 basis points would cause foreign exchange transaction volumes to fall by 14 percent, given all other factors affecting transactions (see subsection 3.1 for the method of calculation). If such a CTT had been applied since 2004, market size in 2007 would still be the largest ever for all the major currencies.

The foreign exchange market is not always expanding. Between 1998 and 2001 transaction volumes in the $ and ¥ markets fell by 11 and 4 percent, respectively, nearly as much in the case of the $ as the estimated effect of a half-basis point CTT.

By these comparisons, it is unlikely that a CTT of 0.5 basis points would disrupt either exchange rate behavior or market liquidity. This is a natural consequence of the fact that our choice of tax rate and estimate of tax-induced volume fall are based on past co-variations of currency spreads and volumes.

[5] This is the case when realized spread values approximate a "Normal" distribution.

Figure 2: Transaction volumes
(with respect to all other currencies)



Source: BIS (2007, Tables 1 and 3, traditional markets at constant April 2007 exchange rates) and our calculations, assuming 240 business days a year.

3 CTT revenue estimates

We estimate revenue from a unilateral CTT of 0.5 basis points, levied separately and uniquely on the $, €, ¥, and £. We also estimate revenue from a CTT coordinated over multiple currencies, including all the major currencies, all the currencies *except* the $, and just the € and £ (Table 2).[6]

3.1 Calculation

Revenue from a CTT would be equal to the tax rate (0.005%) × the post-tax volume of foreign exchange transactions. The post-tax volume depends on the pre-tax volume (v_0), the elasticity of volume with respect to the spread (-0.43), and the percentage increase of the spread due to the tax ($1.0/\bar{s}$, where $\bar{s}$ is the average spread).

Putting all this together, we calculate CTT revenues ($R_{0.5}$) by the following formula.

$$R_{0.5} = 0.00005 v_0 \left\{ 1 - 0.43 \left(\frac{1.0}{\bar{s}} \right) \right\}$$

Recall that we checked these estimates for sensitivity to the spread elasticity of volume. When the elasticity is increased (in absolute value) arbitrarily from -0.43 to -1, estimated revenues fall by 10 percent.

3.2 Expected revenues

A CTT of 0.5 basis points levied only on the $, against all other currencies, would yield an annual revenue of US$ 28.38 billion. A CTT on the € alone would yield US$ 12.29 billion; on the ¥ alone, US$ 5.59 billion; and on £ alone, US$ 4.98 billion.

A coordinated CTT of 0.5 basis points on all the major currencies would yield an annual revenue of US$ 33.41 billion. This is only US$ 5.03 billion more than a tax on the $ alone, since most foreign exchange transactions occur among the major currencies, and most involve the $. A coordinated CTT on all the major currencies *except* the $ would yield a revenue

[6] Since the CTT would be collected by clearing and settlement bodies, in which the two currencies and individual amounts of a trade are matched for processing (true of both netting and final settlement systems), the CTT would be assessed on 'currency pairs'. For example, the tax would be collected once on a purchase or sale involving the ¥ and the $, and again, separately, on a purchase or sale involving £ and the $.

Table 2: Estimated revenue from a CTT of 0.5 basis points
(US$ billions, annual)

Currency	Pre-tax volume[a]	Average spread[b]	1.0/ave. spread	Post-tax volume[c]	Est'd revenue[d]
CTT on $ ...					
$	664,855	2.98	0.34	567,653	*28.38*
... and all other major currencies.					
+ €	+ 83,448	4.48	0.22	+ 75,554	+ *3.78*
+ £	+ 13,560	9	0.11	+ 12,919	+ *0.65*
+ ¥	+ 12,636	9[e]	0.11	+ 12,038	+ *0.60*
Total	*774,499*	...	...	*668,164*	***33.41***
CTT on € ...					
€	285,048	3.17	0.32	245,825	*12.29*
... and £ and ¥.					
+ £	+ 100,200	2.78	0.36	+ 84,689	+ *4.23*
+ ¥	+ 107,916	3.39	0.29	+ 94,459	+ *4.72*
Total	*493,164*	...	...	*424,973*	***21.24***
CTT on ¥.					
¥	127,116	3.59	0.28	111,811	*5.59*
CTT on £.					
£	115,560	3.08	0.32	99,659	*4.98*

Source: BIS (2007, Table 1, at constant April 2007 exchange rates, and Table 3), and Table 1 here.

[a] Against all other currencies, less volumes in the relevant currency pair markets of Table 1 to eliminate double-counting.

[b] Estimated from spreads and transaction volumes in the currency pair markets presented in Table 1.

[c] See subsection 3.1 for the calculation.

[d] See subsection 3.1 for the calculation.

[e] Assumed.

Table 3: Previous CTT revenue estimates

Source	Rate[a]	Base[b]	Volume adjustments	Est.[c]
Felix and Sau (1996)	25	global 1995	• excl off'l transactions 10% • evasion 25% • elasticities −1.5 to −0.75 over time	300
Frankel (1996)	10	global 1995	• elasticity −0.32	166
Nissanke (2004)	1-2	global 2001	• excl off'l transactions 8% • "leakages" 2% • elasticity −0.12 to −0.23[d]	17 - 31
Spratt (2006)	0.5	global 2004	• elasticity −0.11[e]	24

[a]Basis points.

[b]The year indicates which of the triennial BIS surveys of foreign exchange market activity the study uses.

[c]US$ billions, annual.

[d]Implied. The author assumes volume falls as a result of the tax by 5% and 15% for tax rates of 1 and 2 basis points, respectively. When the article was published, the average spread in the $ currency pair markets was 3.79 basis points. Tax rates of 1 and 2 basis points mean spreads would rise by 2 and 4 basis points, or 53% and 106%, respectively. Then the implied elasticities are $ln(0.95)/ln(1.53) = -0.12$ and $ln(0.85)/ln(2.06) = -0.23$, respectively.

[e]Implied, using the average spread in 2004.

of US$ 21.24 billion. A coordinated tax on just the € and £ together would yield US$ 16.52 billion.

3.3 Comparison to previous CTT revenue estimates

CTT rates proposed ten years ago were much higher than they are now (Table 3). This is partly because early proponents saw the CTT, then called the "Tobin tax", as a device both to raise revenue and regulate the foreign exchange market. It is also partly because they were not aware of how narrow dealer spreads are (Tobin, 1996).

Previous estimates of revenue from a CTT range widely because of differences in proposed tax rates and tax bases. Each of those estimates uses the most recent BIS survey of foreign exchange activity at the time. They also consider different factors affecting the change in transaction volume. Some, presuming the tax would be collected from dealing sites or misun-

derstanding the nature of collection in settlement systems, discount volume for evasion. All of them guess the fall in transaction volumes due to the tax-induced increase in spreads.

Our estimates are closest in spirit to those of Spratt (2006). The major reason our overall estimate is nearly US$ 10 billion higher than his is that foreign exchange markets grew enormously since 2004, the year of his information. Minor reasons for the difference are use of different tax bases (he includes all currencies; we include only the four major currencies) and elasticities (he implicitly assumes -0.11 (footnotes *d* and *e* of Table 3) whereas we estimate the elasticity in the \$/¥ market at -0.43) and assumptions for aggregating turnover from daily to annual amounts (he assumes 260 business days per year, implying no holidays; we assume 240 business days a year).

3.4 Comparison to estimated revenue from other sources

There are other potential sources of new finance (Table 4). They are not all comparable to the CTT. The International Finance Facility (IFF) and International Finance Facility for Immunisation (IFFIm) do not raise new revenues, but bring forward normal flows of official development assistance (ODA) so they will peak between 2010 and 2015. Barring changes in policy, ODA would fall commensurately below normal levels after 2020. An issuance of Special Drawing Rights (SDRs) by the IMF for development would likely occur only once.

Some of the new revenue sources, such as the air ticket levy and the IFFIm, are underway, the former as a pilot project in France, the latter as a specialized version of the IFF-proper. We may have more confidence in these revenue estimates than in the others, which are necessarily speculative. At US$ 200 million and US$ 4 billion, respectively, they are at the low end of the new revenue generators, but will bring in much more as other governments join the schemes. The carbon tax has by far the greatest potential to raise revenue, estimated at between US$ 130 and 750 billion each year, depending on the tax rate. However, it is also intended to discourage carbon emissions, so a large share of the revenue may go to the affected industries and employees.

Table 4: Estimates of revenue from other new sources

Device	Rate	Base	Special features	Est.[a]
Air ticket levy[b]	€4 (econ) - €40 (busi)	France	• backed by "Leading Group" of 40+ government members • funds UNITAID, IDPF, IFFIm	0.200
Carbon tax[c]	$0.05-0.35 /US gal.	global	• applied to 5.2 b tons of carbon emissions expected by 2020	130 - 750
Global lottery[d]	...	global	• applied by national lotteries	6
IFF[e]	...	contri-butions	• accelerates ODA to before 2020 • not additional to ODA post-2020 • requires agreement on need	50
IFFIm[f]	...	contri-butions	• accelerates ODA to before 2020 • supported by 8 countries • funds GAVI Alliance	4
SDRs[g]	...	IMF issuance	• one-time allocation for develop't • requires rich governments to transfer allocations to poor gov'ts	25 - 30

[a] US$ billions, annual.
[b] Jouanneau (2006)
[c] Cooper (1998); Sandmo (2004)
[d] Addison and Chowdhury (2004)
[e] Mavrotas (2004)
[f] IFFIm (2007)
[g] Aryeetey (2004)

4 Advantages of the Currency Transaction Tax

The CTT is a feasible new source of revenue for development and other global projects. From previous work by ourselves and others, we know how to implement it. With this study, we also know that it can raise at least US$ 33 billion of independent, global, and stable revenue each year. This is a conservative estimate, since the actual tax base is likely to be much bigger than the traditional foreign exchange markets we use.

We estimate that a CTT of 0.5 basis points, which increases spreads in the major currency markets by one basis point, would lead to a fall in transaction volumes of 14 percent. Post-CTT spreads and transaction volumes would be well within the range of recent observations.

The Currency Transaction Tax appears to be the most immediate and effective new source of financing sought by the Monterrey Conference on Financing for Development in 2002, and by the UN and the "Leading Group on Solidarity Levies to Fund Development" since then.

A Predicting post-CTT transaction volume

To anticipate the fall in foreign exchange transaction volume due to a CTT, we estimated via econometric regression analysis the elasticity of volume with respect to the spread in the \$/¥ market. This makes sense because the CTT is functionally equivalent to the spread in the foreign exchange market. The following paragraphs outline the regression data and model. A complete description will be available soon.

A.1 Data

We used monthly data for the regression and for the descriptive analysis in this paper. Monthly data reveals the long-term relationship between the spread and volume. There is no need to distinguish between expected and unexpected volume since unpredictable transactions are unsystematic and impermanent, tending to cancel each other out over long periods such as a month (Hartmann, 1998). In empirical practice unpredictable volume, driven by news, is defined to have an average value of zero.

Our data on spreads, exchange rates, and exchange rate volatilities are monthly aggregates of business-daily observations on spreads from February 1986 to March 2006, from Olsen Financial Technologies (http://www.olsendata.com). Data on transaction volumes, also from Olsen Financial Technologies, are the sums over each month of Reuters 'ticks', that is, spread-quoting frequency, the number of times dealers change displayed spreads. This is a good proxy for the global volume of daily or lower-frequency transaction volume (Demos and Goodhart, 1996; Hartmann, 1998). They performed better in analysis than data on daily spot transactions by brokers in Japan, from the Nikkei Economic Electronic Databank System (NEEDS) (http://www.nikkeieu.com/needs/pdf/needs_guide.pdf). Monthly data on Japanese exports and imports and quarterly data on Japanese GDP are also from NEEDS. The GDP data were interpolated to obtain monthly data, so as to express exports and imports as fractions of GDP.

A.2 Regression model

To estimate CTT revenue, we are primarily interested in the effect of the spread on volume. However, a lot has been written on the opposite effect, of volume on the spread. To account for both directions of influence, we

specified a simultaneous two-equation regression model. We estimated it by the method of iterated three-stage least squares, using WinRATS6.20 software (http://www.estima.com).

The first equation below contains the effect of the spread on volume. Volume also depends on the volatility of the exchange rate and, following Black (1991), on spreads in other currency markets and on trade in goods and services.

The second equation below captures the effect of volume on the spread, and is adapted from Hartmann (1998).

The full regression model is as follows.

$$v_t = \alpha_0 + \alpha_1 s_t + \alpha_2 \sigma_t + \alpha_3 \left(\frac{s}{s^a}\right)_{t-1} + \alpha_4 T_t + \sum_{i=5}^{k} \alpha_i Y_{ti} + \epsilon_t \tag{1}$$

$$s_t = \beta_0 + \beta_1 v_t + \beta_2 \sigma_t + \sum_{j=3}^{l} \beta_j Z_{tj} + \mu_t \tag{2}$$

in which

v	is the volume of transactions in the \$/¥ market,
s	the bid-ask spread in the \$/¥ market,
s^a	the bid-ask spread in the \$/£ or \$/€ market,
σ	volatility of the ¥ exchange rate,
T	exports plus imports as a fraction of GDP in Japan,
Y, Z	dummies, trends, and lagged left-hand-side variables, and
$\epsilon,\ \mu$	are regression errors.

All variables except Y and Z are expressed in terms of their natural logarithms, which means that the coefficients of interest are elasticities. In particular, α_1, which we found to be statistically significant and equal to -0.43, is the elasticity of the volume of transactions to changes in the spread.

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