Bank of England

Discussion Papers

No 25

The effects of stamp duty on equity transactions and prices in the UK Stock Exchange

by

Mrs P D Jackson
and
A T O'Donnell

October 1985

No 25

The effects of stamp duty on equity transactions and prices in the UK Stock Exchange

by

Mrs P D Jackson
and
A T O'Donnell

October 1985

The authors are economists employed respectively in the Bank of England and HM Treasury. The opinions expressed in the paper are those of the authors and do not necessarily represent the views of either institution.

An earlier version of this paper was presented to a seminar at the Institute of Fiscal Studies at the kind invitation of John King. We are grateful to participants in that seminar particularly John Kay, Mervyn King and Colin Mayer, for their helpful comments. Robert Weeden was instrumental in persuading us to write up this work and also provided many useful comments as did John Flemming and other economists in the Bank and the Treasury. The Inland Revenue kindly provided relevant data. None of the above should be held responsible for the views or errors contained in the paper.

Issued by the Bank of England, London, EC2R 8AH to which requests for individual copies and applications for mailing list facilities should be addressed; envelopes should be marked for the attention of the Bulletin Group.

ISBN 0 903312 78 6
ISSN 0142-6753

Abstract

This paper looks at the effect which stamp duty, on purchases of UK equities, has on the volume of transactions in the UK equity market. The results indicate that a change of one percentage point in the rate of stamp duty has a long-run effect on the volume of equity transactions of 0.7 and an effect on the general level of equity prices of 0.1. These results suggest that the 1984 reduction in stamp duty, from 2% to 1%, could increase the volume of equity transactions by around 70% over a 4-year period (with most of the effect having taken place already) and that equity prices could have been increased by about 10%.

CONTENTS

THE EFFECTS OF STAMP DUTY ON EQUITY TRANSACTIONS AND PRICES IN THE UK STOCK EXCHANGE

1 The purpose of this paper is to present some quantitative estimates of the effects which the stamp duty, charged on purchases of UK equities, has on the volume of transactions in the equity market and the level of equity prices. Section I provides a brief guide to the relevant institutional background. The second section presents a simple economic model of the volume of transactions. Section III looks at the kinds of rules used by some fund managers and explores how their behaviour may be affected by changes in transactions costs. The definition of the variables is set out in Section IV and the econometric specification of the model used to estimate the effect of transactions costs on the volume of trading is explained and the results are presented in Section V. Section VI derives some theoretical predictions about the effect of changing stamp duty on equity prices. The results of a simple rational expectations model explaining changes in share prices are used to test the theory and to quantify the effects of changes in stamp duty (for example the halving of the duty in the 1984 Budget) on the rate of growth of share prices. Finally, Section VII contains a summary of the major conclusions.

I The UK Stock Exchange and Comparative Transactions Costs

2 The London Stock Exchange is the third largest exchange in the world in terms of both market value and turnover, and the fourth largest if the US over-the-counter market (NASDAQ) is included. But in terms of turnover per stock it ranks only tenth, lagging behind many considerably smaller exchanges. The contrast with the US markets is particularly striking. At present each share changes hands on average only once every five or six years in the London market, whereas they change hands on average every two years in the NYSE and almost every year in NASDAQ. Turnover as a percentage of market value was similar to that in New York in 1974, but over the last decade it has remained at around the same level while the figure for the NYSE has almost trebled.

TABLE 1: Market value and turnover in equities in the NYSE Tokyo and London stock exchanges and the NASDAQ market

(£ bn)

	Market value (end year)		Turnover		Turnover as a percentage of market value	
	1974	1983	1974	1983	1974 (%)	1983 (%)
NYSE	205.4	1,048.0	41.5	526.9	20.2	50.3
Tokyo	51.3	369.9	17.6	160.4	34.3	43.4
NASDAQ	..	158.1	..	129.7	..	82.0
London*	31.1	155.7	6.3	28.1	20.3	18.0

Source: The Stock Exchange Fact Book (March 1975), the Stock Exchange Official Year Book (1984-85) and NASDAQ.

* Turnover has been halved for comparative purposes because both purchases and sales are included in the usual UK statistics, whereas only one side of a transaction is included in the US and Japanese statistics.

3 The pattern of share ownership in the UK is markedly different from that in the USA. In the UK the proportion of shares held by persons has been declining for many years whereas the proportion held by insurance companies and pension funds has been rising. Institutions now hold 58% of shares whereas individuals hold only 28% (see Table 2).

Table 2: Distribution of Beneficial Shareholdings by market value

	1963	1969	1975	1981 (%)
Persons	54.0	47.4	37.5	28.2
Insurance Companies	10.0	12.2	15.9	20.5
Pension Funds	6.4	9.0	16.8	26.7
Unit trusts	1.3	2.9	4.1	3.6
Investment trusts and other financial companies	11.3	10.1	10.5	6.8
Banks	1.3	1.7	0.7	0.3
Overseas	7.0	6.6	5.6	3.6
Other*	8.7	10.1	8.9	10.3
Total	100.0	100.0	100.0	100.0
Total market value (£bn)	27.7	37.8	44.5	99.4

* Charities, industrial and commercial companies and the public sector

Source: Stock Exchange Survey of Share Ownership.

In contrast, in the USA, institutions hold a much smaller proportion of shares than individuals (35% against 60%) and there has been little change in the past ten years.

4 The increase in the proportion of shares held by institutions in the UK market has been reflected in a rise in the average value of equity bargains. In 1978 there were around 4 million bargains and the value of all sales and purchases was about £20 billion. In 1984 there were just under 5 million bargains but the value of sales and purchases had increased to £73 billion.

5 The growing predominance of institutions in the UK market cannot, however, be an explanation for the lack of growth in turnover in the London market. Institutions are more active traders (relative to their holdings) than individuals. In 1981, UK individuals accounted for only around 25% of turnover whereas they held around 28% of the shares. UK Institutions in contrast accounted for 66% of the trading activity compared with 58% of the stock. Institutions hold too great a proportion of the shares of individual companies to be able to engage in major reallocations of their portfolios without moving prices against themselves. But they do have an actively traded element to their portfolios.

6 One possible explanation for the lack of growth in turnover may be the level of transactions costs on the London exchange. Comparative transactions costs and turnover rates in the NYSE, Tokyo, London and NASDAQ are shown in Table 3. Clearly London is at a disadvantage compared with its major competitors.

Table 3: Turnover and Transactions Costs in the NYSE, Tokyo, NASDAQ and London in 1983

	Turnover as a percentage of market value	Transactions Costs (£100,000 deal) Purchase & Sale	of which tax
NYSE	50.3	1%	-
Tokyo	43.4	1 3/4%	1/2%
NASDAQ	82.0	1%	-
London	18.0	3 1/4% (now 2 1/4%)	2% (now 1%)

The transactions costs on the purchase and sale of £100,000 worth of equities through the London Stock Exchange currently amount to around 2 1/4 %,

comprised of 1% stamp duty and 1 1/4% commission. Before the halving of stamp duty in the 1984 Budget, the transactions cost figure was 3 1/4%. (The other elements of the transactions costs are relatively minor; there is a CSI levy of 60p on transactions over £5,000 and up until the 1985 Budget there was a contract stamp of up to 60p.) In contrast, transactions costs on a similar deal amount to around 1% in the USA and 1 3/4% in Tokyo. None of these transactions cost figures make any allowance for the size of the market-makers turn, which in London, depending on the exact stock and the state of the market, may be around 1/2%.

7 The reduction in commission levels in the NYSE, after the end of fixed commissions in May 1975, was probably a contributory factor to the substantial growth in turnover seen in the last ten years. Between April 1975 and the end of 1981, commission rates for institutional deals fell by around 50% and commission rates for individuals' deals fell by around 20%.*

8 Transactions costs can have a substantial impact on the expected return from an investment and therefore on the frequency with which investors reallocate their portfolios. Although each listed equity is traded on average once every five or six years, there is a wide disparity in activity in various segments of the market. Some institutions base their trading decisions on the expected return over a period as short as three months. Therefore, before the change in stamp duty in the Budget last year, they would have been looking for gains of 13% pa just to cover the transactions costs and gains of 20% pa before they considered that a deal was worth the effort.

9 The purpose of our research was to see the effect of transactions costs on turnover. In particular, we were interested in discovering the extent to which stamp duty affected the volume of transactions. We have therefore attempted to model the level of equity turnover which is liable for stamp duty. (This means that transactions closed within the Stock Exchange's two-week account period and transactions in letters of allotment are excluded as both are exempt from stamp duty.) But in order to measure accurately the effect of changes in stamp duty we needed to know what other factors were likely to influence turnover. This is the subject of the next section, which develops a simple economic model of equity turnover.

---

* 'Commission rate trends, 1975-1981' by the Directorate of Economic and Policy Analysis of the Securities and Exchange Commission.

10 It is also likely that a reduction in stamp duty will increase the relative attractiveness of equities and hence raise their prices. This effect is considered in Section VI. Most of the empirical work uses data covering the period 1964 to 1984, during which stamp duty was increased from 1% to 2% in May 1974 and reduced to 1% again in April 1984. Some results are also provided in Annex 1 covering a longer period - from 1957 to 1984 - which allows the effects of the cut from 2% to 1% in stamp duty in August 1963 to be included in the analysis.

II An Economic Model of the Volume of Transactions

11 We start from a consideration of the micro-economic factors that might lead to transactions in equities. Traditional micro theory has little to offer on this subject. Supply and demand analysis can provide indications of the effect of changes in transactions costs on prices (this question is tackled in Section VI), but since most analyses are concerned with explaining comparative equilibria, they are of no help in explaining why (or how many) transactions will take place.

12 One of the few attempts to fill this gap is Copeland's (1979) analysis of liquidity changes following stock splits.[1] He postulates that the volume of transactions is a function of current 'information' (I_t) and previously generated news[2] ($I_{t-1} \cdots I_{t-n}$).

13 The importance of news and its relationship with transactions costs and volume are illustrated in figures 1 and 2. The share has an equilibrium price b at time period t, which reflects investors' valuation of the stock, which in turn reflects their expectations regarding future gains. However, not all holders of the share necessarily regard b as the true value of the share. The spread between the highest and lowest valuation in the market is given by ac or τ, and, in an efficient market, this is simply the level of transactions costs. For example, potential holders valuing the share at more than c would be able to buy it at a price which would enable them to be better

---

1 T E Copeland 'Liquidity changes following stock splits', Journal of Finance March 1979. We are grateful to Colin Mayer for bringing this article to our attention.

2 The rest of the model was of limited applicability - the volume of transactions in share j is explained as a function of market volume and the information terms are incorporated within the error term.

off, even after paying the transactions costs. The figures below show the distribution of investors (the number weighted by their buying/selling power) valuing the stock at the prices shown on the horizontal axis.

Figure 1

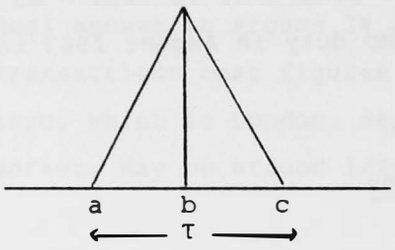
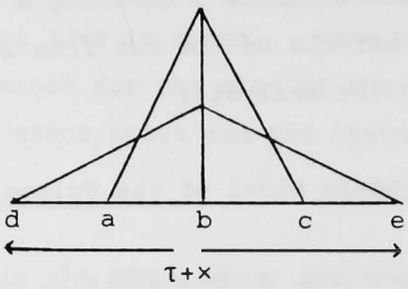


Figure 2



14 Now consider the effect of news on share prices. For simplicity imagine an announcement that left the price set by the market makers unchanged but caused individual shareholders to change their valuations. This might be the result of an announcement that a planned investment by a firm would involve less expenditure immediately but rather more at a later date. Individual responses to this announcement might well be different simply because different owners had different discount rates. Individuals holding price expectations at e would have an incentive to purchase large volumes of stock which would tend to move the market price above b. But if they were risk averse they would have limits on the proportion of their portfolios which they were prepared to invest in a particular stock; many institutions have target proportions for their holdings of individual companies' shares and some have explicit limits on the proportion of the shares of a single company which they are willing to hold, while others have set limits on the proportion of their portfolios which they are willing to invest in a single company's equity. The situation might become like that shown in figure 2. In the transition period, before the market has adapted to the news, some individuals expect to make gains by purchasing extra holdings while others expect to make gains by selling their holdings. The following results are fairly obvious from the figure:

(i) any news item which causes the range of valuations to be greater than the level of transactions costs will induce trades in the relevant shares, even though there may be no change in the market price; and

(ii) an increase in transactions costs will reduce the amount of trades resulting from 'important' news announcements (where 'important' implies news that widens the spread of valuations).

15 The problem is to find some way of measuring how much new important information, which would change expectations, is received by the market in each period. One possibility is that the amount of news can be measured indirectly through its impact on prices. New information can be expected to lead to changes in prices. Major news items, such as takeover rumours, would lead to substantial changes in price. Prices can also be regarded as carrying vital information on supply and demand in the market i.e. other market participants' activities. Thus price movements often feed on themselves producing speculative bubbles. The rationale for this is that investors, interested in short-term gains, second guess the behaviour of other market participants and use current buying or selling as a guide to future behaviour. On the other hand, as the earlier example showed, it is possible that information could induce trades without altering prices.

16 The actual volume of shares traded on the UK Stock Exchange is also likely to be affected by a number of other factors, namely:

(i) the number and value of shares in the market (TQ)
(ii) the net inflows and liquidity of the life assurance and pension funds, which are the dominant investors (NI)
(iii) merger and acquisition activity (M)
(iv) capital gains tax rules (G)
(v) transactions costs (TC)

17 The first factor, the size of the market, provides a scaling measure. As the volume of shares quoted on the Stock Exchange grows so we might expect the volume of transactions to grow. Shorter-run variations might also be expected to respond to the net inflows into the Life Assurance and Pension Funds (LAPFs). Net inflows into LAPFs, which amounted to £16 1/2 billion in 1984, are likely to be an important factor in determining the demand for shares. With a rapidly growing balance sheet, LAPFs must conduct a large volume of share transactions, each year, just to maintain their share of the total portfolio at a desired level. A quarter of LAPF assets are invested in UK ordinary shares.

18 Merger activity is also likely to stimulate transactions not only directly but indirectly as the process of a bid, whether successful or not, generates uncertainty which again widens the spread of valuations - although it is not possible to construct a variable which includes unsuccessful as well as successful bids.

19 The capital gains tax regime is also likely to have affected transactions volumes - capital gains tax affects individual investors and insurance companies (pension funds are exempt) and in the early years it also affected investment trusts and unit trusts, although they were given favourable treatment. A short-gains tax, at the marginal income tax rate, (on gains realised in under 6 months) was introduced in 1962. A fully fledged long-term capital gains tax was introduced in 1965. The changes in the regime for individual investors, particularly changes in the level of exemptions, may have had a significant effect on transactions volumes in the period since the introduction of these taxes. At the introduction of capital gains tax in 1965, long-term gains were assessed at 30%, or partially assessed as income, while, under the short-gains tax, gains made within twelve months were assessed wholly as income. In 1971, the distinction between short and long-term gains was removed and all gains were charged at 30% or partially as income. In 1977, the first £1,000 was made exempt and a rate of 15% was charged on the next £4,000 and the option to charge some gains as income was removed. A further change came into force in Q1 1981 with a £3,000 exemption limit but no lower-rate provisions. The £3,000 was increased to £5,000 in Q1 1982 and thereafter the limit was increased by £300 per annum and indexation was introduced. In addition, the removal of disposals on death from the ambit of the tax in 1971 could have had a significant effect on the transactions behaviour of individuals. The effects are complicated by the fact that a major fall in equity prices can mean that the market is sheltered from paying tax for many years to come.

20 It has not been possible to devise a satisfactory method of modelling all these changes. Various combinations of dummy variables were tried but the only significant effect was obtained from a dummy variable taking the value 1 in Q1 each year from Q1 1981. This reflects the introduction of the substantial exemption limits in that year, which encouraged individuals to take gains or losses (to use up the limits) by the end of the financial year.

21 Hence the value of transactions can be expressed as:

$$V_t = f(TQ_t, NI_t, TC_t, G_t, M_t, I_t) \quad \ldots\ldots(1)$$

Information at time t is likely to depend upon the current and recent past behaviour of prices:

$$I_t = g(\Delta \ln P_{st}, \Delta \ln P_{st-1}, \ldots \Delta \ln P_{st-n}) \ldots\ldots(2)$$

Combining (1) and (2), defining the equation in terms of transactions volume, and taking a log linear form gives:

$$\ln(V/P_s)_t = a_o + a_1 \ln(TQ/P_c)_t + a_2 \ln(M/P_s)_t - a_3 \ln TC_t + a_4 G_t$$

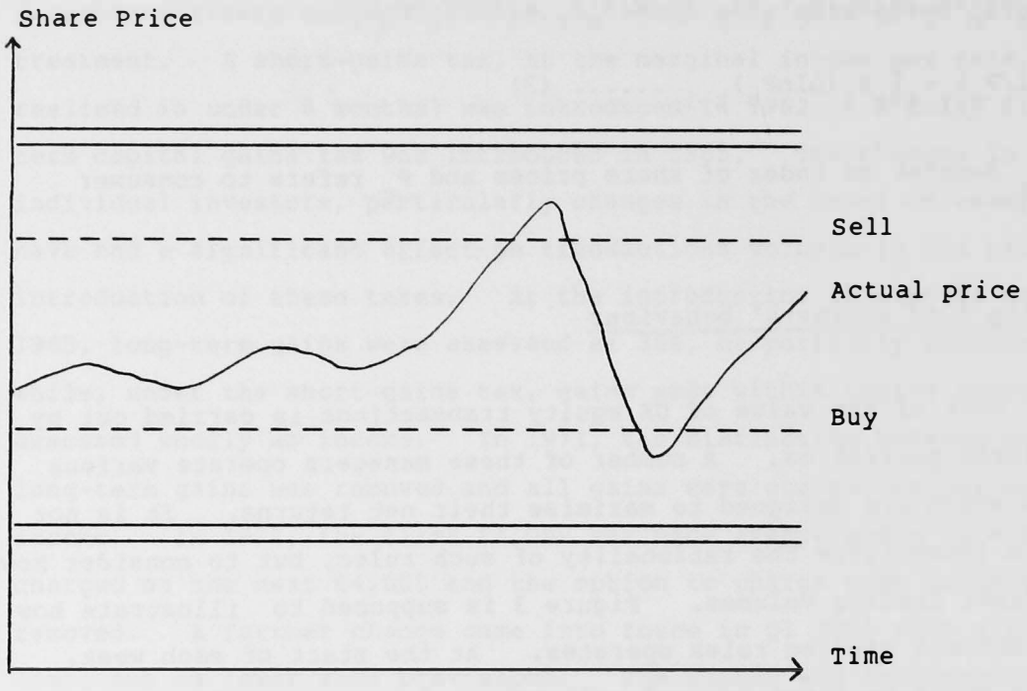
$$+ a_5 \ln(NI/P_s)_t + \sum_{i=o}^{n} \beta_i (\Delta \ln P_s)_{t-i} \quad \ldots\ldots \quad (3)$$

where P_s denotes an index of share prices and P_c refers to consumer prices.

III Modelling fund managers' behaviour

22 The vast bulk of the value of UK equity transactions is carried out by managers of large portfolios. A number of these managers operate various trading rules which are designed to maximise their net returns. It is not our purpose to investigate the rationality of such rules, but to consider how they would affect trading volumes. Figure 3 is supposed to illustrate how one of the commonest trading rules operates. At the start of each week, equity dealers would be given buy and sell prices for shares held in the fund's portfolio. The trigger levels are shown as dotted Lines on the figure. These trigger levels are an aid to swift decision making. The manager decides in advance at what price he would be prepared to buy a stock, given the expected returns and the transaction costs, and at what price he would be prepared to sell it. If the offer price in the market falls to his buy price or if the bid price rises to his sell price he places an order. The width of the trigger limits is likely to be set according to the share's past volatility as well as the level of transactions costs. A reduction in stamp duty might therefore reduce the limits not only directly but indirectly through its affect on reducing the volatility of equity prices - more actively traded stocks tend to have lower price volatility.

Figure 3



23 Economists tend to be sceptical about explanations which rely on non-optimising behaviour. However, it could be argued that these rules serve as reasonable approximations to optimal behaviour, particularly for funds which make strategic decisions centrally and then want to instruct their dealers to act in a way that is consistent with the overall strategy.

IV The Definitions of the Variables*

24 The equity transactions variable included only those transactions on which stamp duty was paid (see page 4). The transactions costs used in the model were the costs on a deal, consisting of a buy and a sell. The main transactions costs on a purchase are stamp duty, brokers' commission and half the jobbers' bid and offer spread - the difference between the purchase price and the mid-price. The main transactions costs on a sale are just the commission plus half the jobbers' spread. No allowance was made for the jobbers' spread in the transactions costs in the main equation (although the sensitivity of the results to the inclusion of an estimated spread was tested, see Annex 1) but a figure was included for commission. The current commission rate on an average size bargain (£17,000) is 1%, which would give commission of 2% on a buy and sell. But this average is distorted by the large number of small bargains, which account for a relatively small proportion

*the data sources are shown in Annex 3

transactions. For around 75% of transactions, by value, the commission is less than 1/2%. We included a figure of 3/4% for the commission on a deal (buy and sell). This is of course a rough estimate because fixed commission rates have been altered at various times.

25 The scale variable, which was included in the model, was the market value of companies' shares listed on the Stock Exchange, deflated by the consumer price index - which approximates the real worth of the shares. The mergers activity measure was the total expenditure on mergers and acquisitions by industrial and commercial companies. The CGT dummy variable took the value 0 up to 1980; thereafter it was set equal to 1 in Q1 and 0 otherwise.

V The Econometric Specification

26 The purpose of the empirical work was to obtain a reliable estimate of the effect of stamp duty on equity transactions. The value of transactions deflated by the Financial Times All Share Index is shown in Chart 1. Chart 2 shows the real value of equities quoted on the Stock Exchange. Together the charts illustrate that there is no simple correlation between growth in the size of the market and growth in transactions.

27 The economic model presented in section II suggested estimating an equation of the form:

$$\ln(V/P_s)_t = a_o + \sum_{i=1}^{n} \alpha_i \ln(V/P_s)_{t-i} + \sum_{i=o}^{n} \beta_i \Delta\ln P_{st-i} + \sum_{i=o}^{n} \gamma_i (|\Delta\ln P_{st-i}|)$$
$$+ \sum_{i=o}^{n} \delta_i \ln(NI/P_s)_{t-i} + \sum_{i=o}^{n} \eta_i \ln(TQ/P_c)_{t-i} + \sum_{i=o}^{n} M_i (\ln TC_{t-i})$$
$$+ \sum_{i=o}^{n} W_i \ln(M/P_s)_{t-i} + a_1 G_t + \text{seasonal dummies} \quad \ldots\ldots\ldots\ldots \quad (4)$$

(see paragraph 16 for an explanation of the notation.)

28 This fairly general unrestricted model was estimated setting n equal to 4. Other lags were tested, n was also set equal to 5, and the results were little different. The equation, listed in Annex 1, appears to be reasonably well specified. The usual procedures for testing down to a parsimonious form were adopted. The properties of the final equation, selected by means of imposing restrictions that did not violate the data, are shown in table 4. (The detailed results are shown in Annex 1.)

29 Given our belief that the level of transactions is primarily related to news and that changes in share prices might not be a good proxy for news, the degree of fit is surprisingly high. ($\bar{R}^2$ = 0.865 and the standard error of

CHART 1

VOLUME OF TRANSACTIONS IN THE UK STOCK EXCHANGE ($\ln V/P_s$)

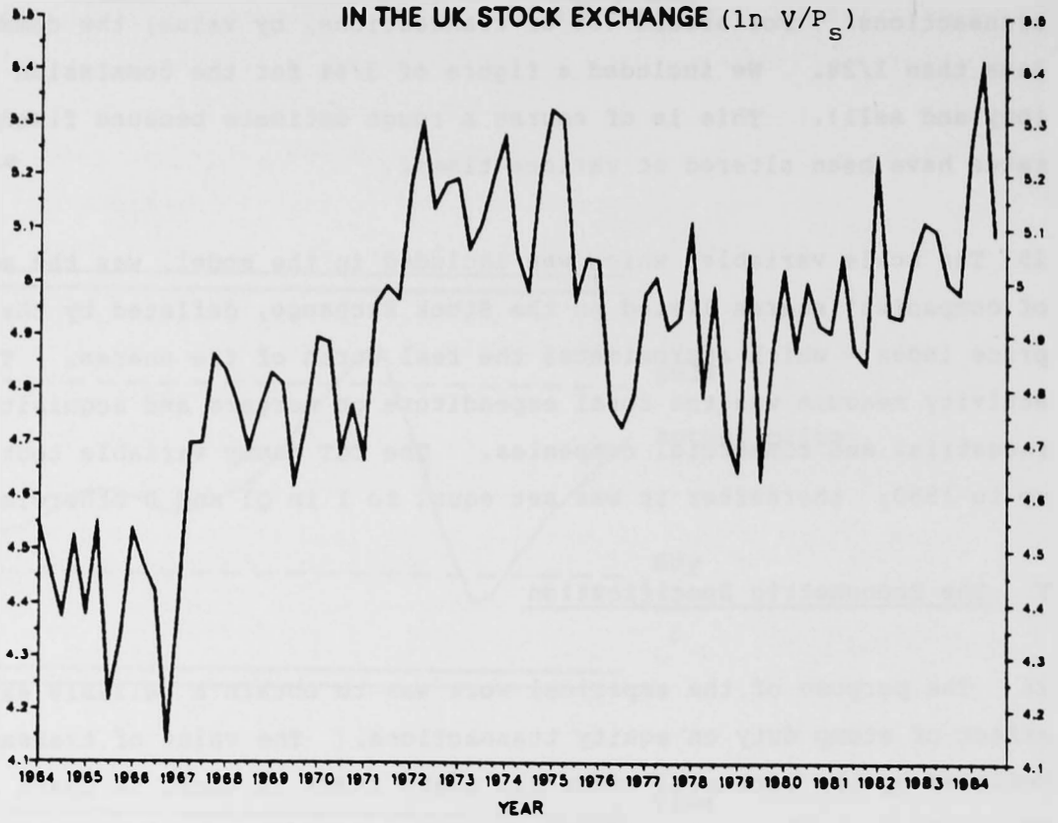
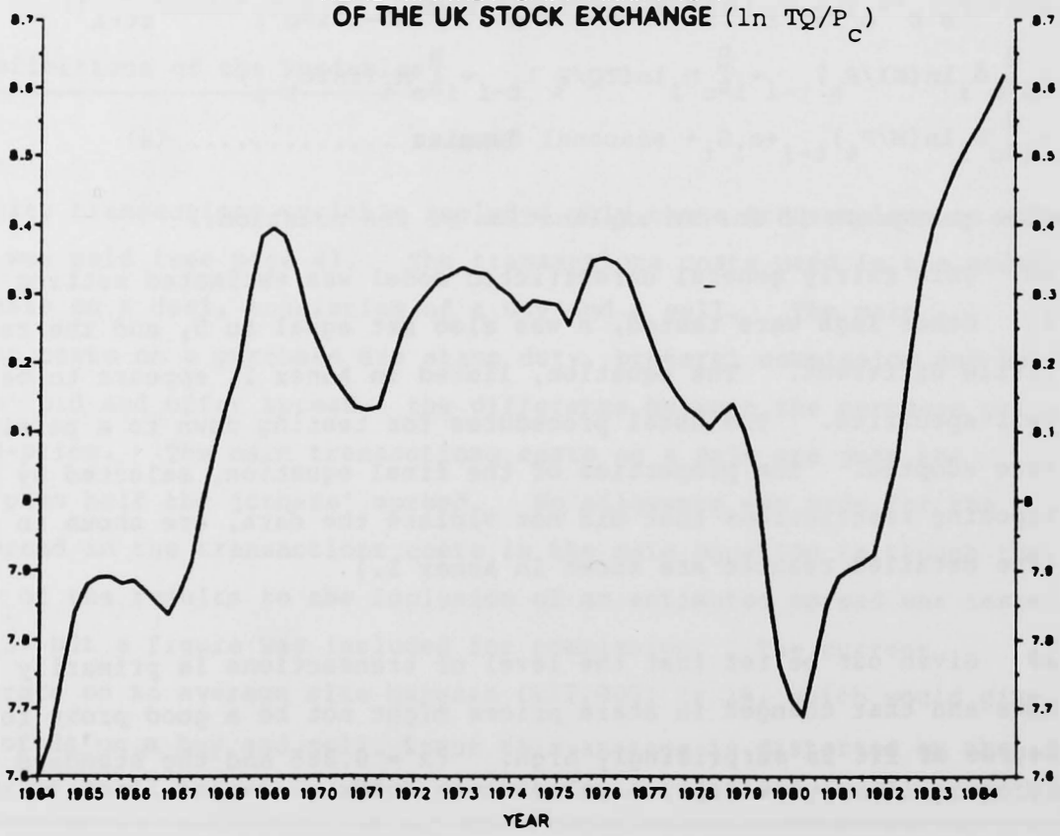


CHART 2

REAL MARKET CAPITALISATION OF THE UK STOCK EXCHANGE ($\ln TQ/P_c$)



the regression is 2% of the mean value of the dependent variable.) As Chart 1 revealed, the dependent variable is certainly not dominated by trend effects as is often the case in time series work.

Table 4: Impact and long-run effects on transactions

	Impact Effect	Long-run effect
Transactions costs:	-0.48	-1.65
Increase in prices:	1.11	3.20
Fall in prices:	-0.04	-1.93
Real mergers and acquisitions:	0.06	0.13
Real net inflows to LAPFs :	0.34	0.76
CGT effect:	0.13	0.28
Size of market:	1.36	0.63
Q3 seasonal dummy:	-0.09	-0.20

30 The long-run size-of-market effect seems quite plausible. It implies that a 10% increase in market capitalisation will increase transactions volume by around 6 1/2%. It is not surprising to find an elasticity of less than unity on the market size variable, because trading activity in any period tends to be concentrated in particular shares rather than evenly spread over the whole market. The shares of large UK multinationals tend to be particularly actively traded, perhaps because more information is available on such companies. The short-run elasticity probably reflects a new issues effect - new issues tend to be heavily traded for a period until the market has settled down.

31 The CGT dummy for Q1 suggests that there are more transactions in that quarter as agents use up their capital gains allowances. The Q3 seasonal dummy suggests that there is less activity in July to September - presumably because brokers and individual holders are on holiday.

32 The mergers activity effect has the right sign and is fairly small as might be expected. On the other hand, the effect of higher net inflows to LAPFs is quite large. LAPFs devote only about 30% of their cash flow to purchasing equities but the effect of higher inflows on the volume of transactions is estimated to be over twice as large. This variable is

probably picking up two effects - the original allocation of the net inflows into LAPFs, needed to maintain a constant portfolio share, and also the effect that growing institutional share ownership has on overall turnover, because the institutions are more active traders than other holders, particularly individuals.

33 The effect of rising prices is extremely powerful. Falling prices tend to reduce the level of transactions presumably because of unwillingness to realise losses and other tax and psychological factors.

34 But our particular concern is with the transactions cost elasticity. Our estimates imply that a cut in stamp duty from 2% to 1% will increase transactions by around 70% in the long run. The long-run effect is defined as the ratio of the sum of the coefficients on transactions costs to one minus the sum of the coefficients on the lagged dependent variable. This ratio does not follow any simple distribution, but it is possible to obtain a confidence interval for it using methods explained in Critchley, O'Donnell and Swales (1979)[1]. The (at least) 95% confidence interval for the long-run effect of -0.7, is from -0.4 to -1.2. This provides further evidence that the stamp duty effect is unlikely to be small.

35 It would be unwise to place too much faith on the results of an equation estimated over a single period. To test the stability of the transactions cost effect we re-estimated the equation from 1964 onwards each time dropping out the earliest year up to 1971. The results, shown in Table 5, are remarkably stable. (Details of the stability of the other elasticities are given in Annex 1; they are also reasonably stable.)

Table 5: Transaction Costs and Stamp Duty Effects on Volume

Start date for estimation period (Finish date is 1984 Q3)	Elasticities		Implied effect on volume of a fall in stamp duty from 2% to 1%
	Impact	Long run	
1964	-0.5	-1.6	-0.7
1965	-0.4	-1.6	-0.7
1966	-0.5	-1.7	-0.8
1967	-0.5	-1.6	-0.7
1968	-0.5	-1.5	-0.7
1969	-0.5	-1.3	-0.6
1970	-0.5	-1.5	-0.7
1971	-0.6	-1.3	-0.6

1 'On calculating the optimal size of firms: an inference method for ratios', mimeo, University of Glasgow, August 1979.

36 The speed with which the various effects comes through is shown in the cumulative response diagrams in Charts 3 and 4. About two thirds of the effect of a change in transactions costs comes through within a year. The full effect is felt after around four years.

37 Chart 5 shows a dynamic track of the estimated equation. The fit is quite impressive but a stronger test is to estimate the equation up to, say, 1983 Q1 and see how well it forecasts the effects of the change in stamp duty in the 1984 Budget. The predicted and actual values can be compared using the Chow and the more stringent Hendry forecasting tests.

38 As Table 6 shows, the forecasts pass both these tests and appear to be unbiased.

Table 6: Static and Dynamic predictions of the volume of transactions

(a) STATIC

	Forecast	Actual	Forecast Error	Standard Error of forecast
1983 Q2	5.0901	5.0961	-0.0061	0.1130
1983 Q3	4.9504	4.9996	-0.0493	0.1133
1983 Q4	5.0032	4.9792	0.0240	0.1144
1984 Q1	5.3446	5.2502	0.0944	0.1323
1984 Q2	5.3773	5.4106	-0.0333	0.1797
1984 Q3	5.0985	5.0886	0.0099	0.1910
		Mean error	-0.0066	
		Root mean squared error	0.0468	
		Theil's U	0.0046	

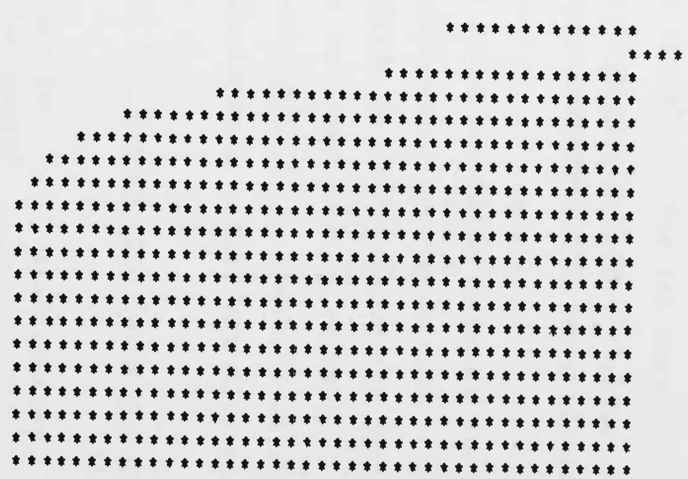
Hendry Test	$X^2(6)$	1.24
95% Significance Level	$X^2(6)$	12.59
Chow Test	F(6,58)	0.141
95% Significance level	F(6,58)	2.25

CHART 3(a)

CASE 1 TRANSACTIONS COSTS EFFECT

LAG CUMULATIVE RESPONSE FUNCTION B(I) = SIGMA A(I)

B(0)	-0.4644+00
B(1)	0.1358+00
B(2)	-0.6484+00
B(3)	-0.1083+01
B(4)	-0.1325+01
B(5)	-0.1458+01
B(6)	-0.1533+01
B(7)	-0.1574+01
B(8)	-0.1597+01
B(9)	-0.1609+01
B(10)	-0.1616+01
B(11)	-0.1620+01
B(12)	-0.1622+01
B(13)	-0.1623+01
B(14)	-0.1624+01
B(15)	-0.1624+01
B(16)	-0.1625+01
B(17)	-0.1625+01
B(18)	-0.1625+01
B(19)	-0.1625+01



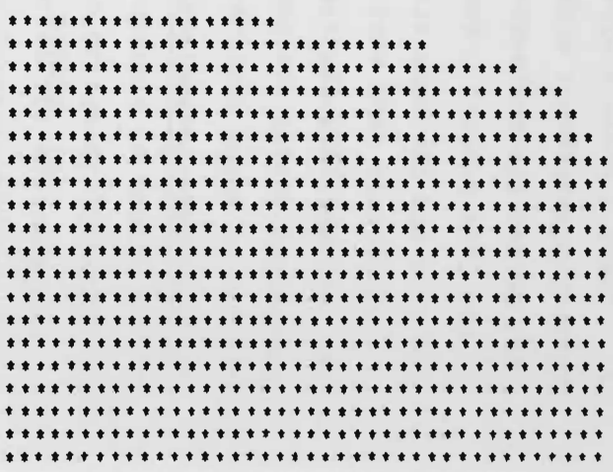
Long run: 1.625

Mean lag: 3 quarters

CASE 2 REAL NET INFLOWS TO LAPFS

LAG CUMULATIVE RESPONSE FUNCTION B(I) = SIGMA A(I)

B(0)	0.3297+00
B(1)	0.5126+00
B(2)	0.6140+00
B(3)	0.6703+00
B(4)	0.7015+00
B(5)	0.7188+00
B(6)	0.7284+00
B(7)	0.7337+00
B(8)	0.7367+00
B(9)	0.7383+00
B(10)	0.7392+00
B(11)	0.7397+00
B(12)	0.7400+00
B(13)	0.7402+00
B(14)	0.7402+00
B(15)	0.7403+00
B(16)	0.7403+00
B(17)	0.7403+00
B(18)	0.7403+00
B(19)	0.7403+00



B(18) 0.7403+00
B(19) 0.7403+00

CHART 3(b)

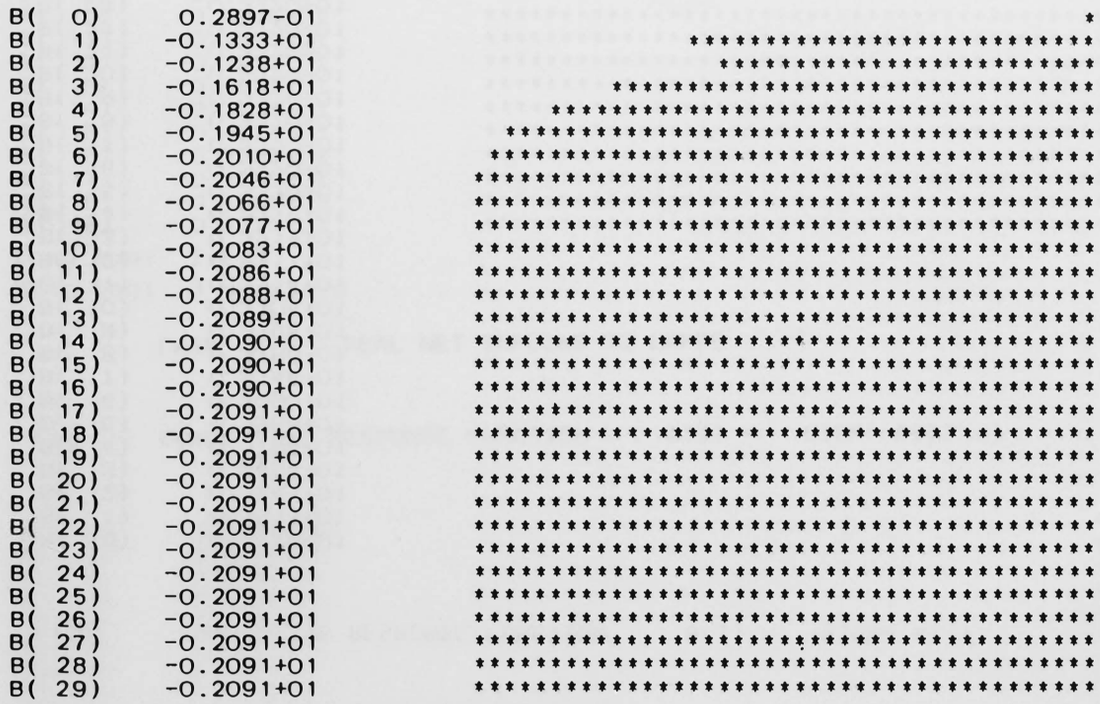
CASE 3 INCREASE IN PRICES

LAG	CUMULATIVE RESPONSE FUNCTION B(I) = SIGMA A(I)	
B(0)	0.1116+01	**********
B(1)	0.1513+01	**********
B(2)	0.1841+01	**********
B(3)	0.2456+01	**********
B(4)	0.2796+01	**********
B(5)	0.2985+01	**********
B(6)	0.3090+01	**********
B(7)	0.3148+01	**********
B(8)	0.3180+01	**********
B(9)	0.3198+01	**********
B(10)	0.3208+01	**********
B(11)	0.3214+01	**********
B(12)	0.3217+01	**********
B(13)	0.3218+01	**********
B(14)	0.3219+01	**********
B(15)	0.3220+01	**********
B(16)	0.3220+01	**********
B(17)	0.3220+01	**********
B(18)	0.3220+01	**********
B(19)	0.3220+01	**********
B(20)	0.3220+01	**********
B(21)	0.3220+01	**********
B(22)	0.3220+01	**********
B(23)	0.3220+01	**********
B(24)	0.3220+01	**********
B(25)	0.3220+01	**********
B(26)	0.3220+01	**********
B(27)	0.3220+01	**********
B(28)	0.3220+01	**********
B(29)	0.3220+01	**********

Long run: 3.22
Mean lag: 2 quarters

Chart 3(c): CASE 4 FALL IN PRICES

LAG CUMULATIVE RESPONSE FUNCTION B(I) = SIGMA A(I)



Long run: -2.09

Mean lag: 2 quarters

CHART 4 (a) CASE 6 Mergers

CHART 4 (a) CASE 6 Mergers

LAG CUMULATIVE RESPONSE FUNCTION B(I) = SIGMA A(I)

B(0)	0.5711-01	**********
B(1)	0.8878-01	**********
B(2)	0.1064+00	**********
B(3)	0.1161+00	**********
B(4)	0.1215+00	**********
B(5)	0.1245+00	**********
B(6)	0.1262+00	**********
B(7)	0.1271+00	**********
B(8)	0.1276+00	**********
B(9)	0.1279+00	**********
B(10)	0.1280+00	**********
B(11)	0.1281+00	**********
B(12)	0.1282+00	**********
B(13)	0.1282+00	**********
B(14)	0.1282+00	**********
B(15)	0.1282+00	**********
B(16)	0.1282+00	**********
B(17)	0.1282+00	**********
B(18)	0.1282+00	**********
B(19)	0.1282+00	**********

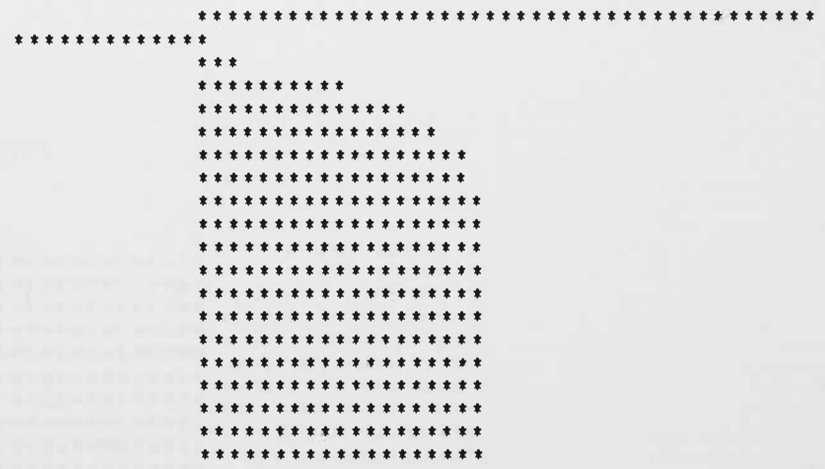
Long run: 0.128Z

Mean lag: 1 quarter

CHART 4(b) CASE 5 REAL MARKET CAPITALISATION

LAG CUMULATIVE RESPONSE FUNCTION B(I) = SIGMA A(I)

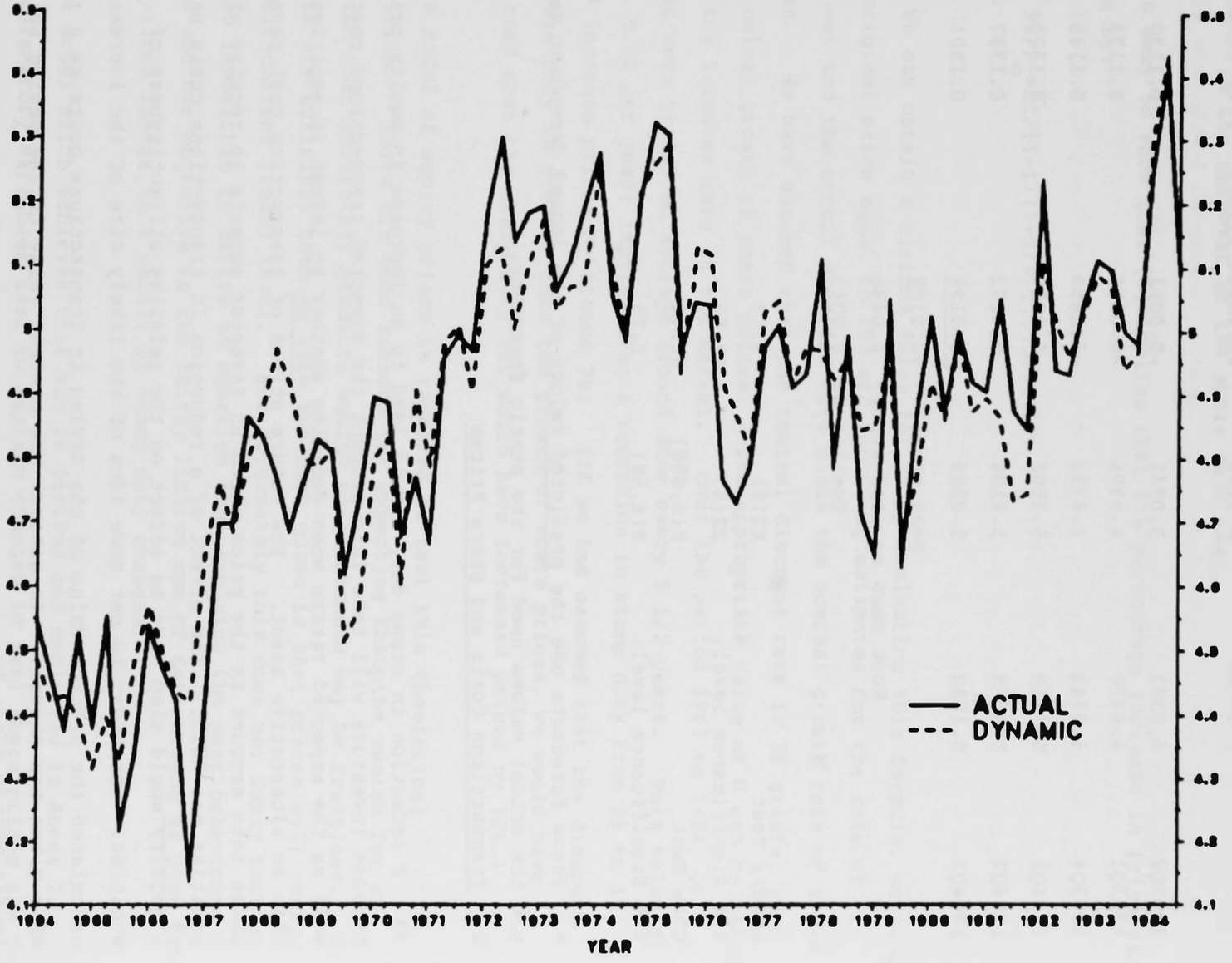
B(0)	0.1356+01
B(1)	-0.3810+00
B(2)	0.7299-01
B(3)	0.3248+00
B(4)	0.4645+00
B(5)	0.5420+00
B(6)	0.5849+00
B(7)	0.6088+00
B(8)	0.6220+00
B(9)	0.6293+00
B(10)	0.6334+00
B(11)	0.6356+00
B(12)	0.6369+00
B(13)	0.6376+00
B(14)	0.6380+00
B(15)	0.6382+00
B(16)	0.6383+00
B(17)	0.6384+00
B(18)	0.6384+00
B(19)	0.6384+00



Long run: 0.6384

mean lag: 2 quarters

CHART 5: **DYNAMIC SIMULATION OF THE VOLUME OF TRANSACTIONS**



(b) DYNAMIC*

	Forecast	Actual	Forecast Error	Standard error of forecast
1983Q2	5,0901	5,0961	-0.0061	0.1130
1983Q3	4.9470	4.9996	-0.0526	0.1133
1983Q4	4.9742	4.9792	-0.0050	0.1145
1984Q1	5.3419	5.2502	0.0916	0.1323
1984Q2	5.4278	5.4106	0.0172	0.1797
1984Q3	5.1080	5.0886	0.0194	0.1901
		Mean error:	-0.0108	
		Root mean squared error:	0.0446	
		Theil's U:	0.0043	

Hendry Test	X2(6)	1.12
95% Significance level:	X2(6)	12.59
Chow Test	F(6,658)	0.141
95% Significance level:	F(6,58)	2.25

* These forecasts use the predicted values of the lagged dependent variable, not the actual values used for the static forecasts.

V Transactions Costs and Share Prices

39 A reduction in stamp duty should lead to an increase in equity prices because investors will take into account the expected transactions costs as well as the expected return when deciding whether to invest in equities rather than an alternative asset. The future stream of transaction cost payments is taken into account in the price which an investor expects to receive when the equities are sold. The effect of a reduction in transactions costs on market liquidity would also have an effect on the relative attractiveness of equities. In order to get some idea of the likely size of the increase we calculated the present value of the saving in transactions costs as a result of a given tax change. In general the present value of the saving is approximately given by:

$$PV=\Delta\tau P_o \sum_{i=1}^{\infty} 1/(1+d/s)^i \quad .....(5)$$

where $\Delta\tau$ is the change in the tax rate

P_o is the original price of the share

d is the annual discount rate minus the nominal growth rate of share prices

s is the turnover of the share each year.

It is easy to show that (5) implies that the percentage increase in price is given by:

$$PV/P_o = \Delta\tau/[1-1/(1+d/s)] \quad \ldots\ldots\ldots (6)$$

40 We can obtain a minimum value for PV by evaluating this formula, setting the original price equal to 100 and including estimates for the rate of turnover and the annual discount rate minus the nominal growth rate of share prices. We have assumed that the nominal discount rate is 3% greater than the nominal growth of share prices. The appropriate value of s can be taken from the turnover rate in the market. Over the period 1963 to 1984, UK shares were traded on average around once every 5 1/2 years. This value of s (i.e. 0.18 per year) implies that a reduction in stamp duty from 2% to 1% would increase prices by around 7%. (If we had assumed that the discount rate was only 2% greater than the growth of share prices, we would have predicted that the stamp duty cut would have increased prices by 10%.)

41 A model of equity prices is required to test this theoretical prediction. There are good reasons for expecting that the search for an equation that accurately predicts equity price changes may be fruitless. If markets are efficient then ex ante our best guess is that prices will remain at their current (real) level. But fortunately this does not imply that it will be impossible to derive an equation that explains the past behaviour of prices and our objective is the fairly limited one of determining ex post how much prices change as a result of stamp duty changes.

42 A model which achieves this aim is derived and estimated in Annex 2. The explanatory variables used to explain changes in real share prices are the change in the 20-year par yield on gilts and the transactions cost measure. We have not spent much time searching for the best possible fit but our limited experience with other specifications suggests that the size of the transactions cost effect is fairly stable. The implication of the estimates

is that a cut from 2% to 1% in stamp duty would increase prices by around 10 per cent. This is in line with our estimate of the effect on prices of the discounted flow of transactions costs payments.

VII Summary

43 This paper has shown that changes in stamp duty have significant effects both on the volume of transactions and on the level of share prices. Merger activity, the level of inflows to LAPFs, the size of the market and increases in prices are all found to stimulate transactions. Reductions in stamp duty have a similar effect, with a cut from 2% to 1% predicted to increase the volume of transactions by around 70%. Such a cut is also estimated to lead to a rise in prices of possibly as much as 10%. All these estimates are subject to reasonably wide margins of error but they establish that the effects on turnover and prices are far from negligible.

ANNEX 1: THE TRANSACTIONS EQUATION

The estimates of the general unrestricted equation are shown in Table A2.1. They are broadly satisfactory although there is some evidence of residual fourth order autocorrelation. The preferred parsimonious equation is shown in Table A2.2. There is still some evidence of fourth order autocorrelation but in most other respects the equation performs well. The implied long-run elasticities are shown in Table A2.3. This table shows how the estimated long-run elasticities vary as the estimation period is amended to drop the earlier year from the start of the regression. The elasticities on the fall in prices and the size of the market are the least stable but they are in all cases significantly different from zero and of the expected sign.

As a final check on the specification we were able to obtain transactions data back to 1955. Unfortunately reliable quarterly data for expenditure on mergers and acquisitions and net inflows to LAPFs were not available. But we estimated a simple equation, excluding these variables, over the extended period 1955Q3 - 1984Q3 which includes a reduction from 2% to 1% in stamp duty in August 1963. The results are given below:

$$\ln(V/P)_{st} = \underset{(3.2)}{0.74} + \underset{(18.7)}{0.86}\ln(V/P)_{st-1} + \underset{(2.7)}{0.22}\,Q_1 CGT - \underset{(2.4)}{0.51}\ln(TC)_t$$

$$+\underset{(3.5)}{1.00}\ln(TC)_{t-1} - \underset{(2.6)}{0.61}\ln(TC)_{t-2} + \underset{(3.2)}{1.02}(|\Delta\ln P_{st}|) - \underset{(3.0)}{0.92}(|\Delta\ln P_{st-1}|)$$

$$+\underset{(2.1)}{0.40}\Delta\ln P_{st} + \underset{(1.8)}{0.36}\Delta\ln P_{st-1} - \underset{(2.0)}{0.37}\Delta\ln P_{st-2}$$

$\bar{R}^2 = 0.82$
S.E. = 0.15
L.M (1): 4.52
L.M (4): 16.32

The implied long-run transactions cost elasticity is -0.9, suggesting that a cut from 2% to 1% in stamp duty would increase transactions by around 40%. The lower elasticity is not altogether surprising. The omission of two important variables almost certainly means that the model is mis-specified and the elasticity estimates are therefore likely to be biased (in an unknown direction). In earlier work one of us estimated a model designed simply to

quantify the effect of the halving of the duty in 1963. The results implied that the cut in duty increased transactions by just under 70% in the long run much the same as our estimate for the 1974 and 1984 changes.

Simultaneity Problems

It is quite possible that the price variables in the transactions equation are simultaneously determined if market participants derive their price expectations in part from observing the volume of activity. In fact Wu-Hausman exogeneity tests suggested that these terms could be treated as exogenous but such tests are known to be of fairly low power. We therefore re-estimated the transactions equation replacing the change in share prices (in the actual and absolute terms) and the share price deflator used to calculate real net inflows and real merger activity, by the appropriate predictions from the share price equation described in Annex 2. The long-run elasticities from this instrumented equation and the OLS estimates are shown in Table A2.4. The estimates are very similar apart from the effect of a fall in prices. The transactions cost elasticity is a little bigger and implies that a reduction from 2% to 1% in stamp duty would eventually increase transactions by around 80%.

In Section I we pointed out that the size of the jobbers' turn varies with the state of the market. No time series information is available on the amount of the jobbers' turn. But even if it did exist it is not clear that it would be appropriate to use it because of simultaneity problems. Transactions costs would then vary with the rate of change of prices which are determined simultaneously with transactions. Our measure of transactions cost can therefore be defended as an accurate 'purged' instrument of the level of costs.

We decided to test the sensitivity of the stamp duty effect to the inclusion of an assumed figure for non-stamp duty costs of 1 1/4%. This reflected the commission charges (3/4%) and a further 1/2% as a rough estimate of the jobbers turn. This had no effect on the estimates of the elasticities other than that for transactions costs which became -2.2. This implies that a cut in stamp duty from 2% to 1% would raise transactions by 80%, [Δ ln (TC) is now only 0.37] a little above our central estimate.

PRECISE DEFINITIONS OF VARIABLES USED IN THE ECONOMETRIC ANALYSIS

Notation		Definition
LNVP	$(\ln V/P_S)$	The log of transactions on which stamp duty is paid deflated by FT all share price index
LTC	$\ln(TC)$	The log of transactions costs (defined as 3/4% plus the rate of stamp duty)
DUM3		A quarterly seasonal dummy taking the value 1 in the third quarter
Q1CGT	(G)	A dummy taking the value 1 in Q1 from 1981 onwards
PDOT	$(\Delta \ln P_S)$	The change in the previous quarter in the log of the FT all share index
ABSPDOT	$(\lvert\Delta \ln P_S\rvert)$	The absolute value of the change in the log of the FT all share index
LPC	$\ln(TQ/P_C)$	The log of the market value of equities quoted on the London Stock Exchange deflated by the consumer's price index
LNIP	$\ln(NI/P_S)$	The log of net inflows to LAPF's deflated by the FT all share index
LTP	$\ln(M/P_S)$	The log of expenditure on mergers and acquisitions deflated by the FT all share index
DRUK20	Δr	The change on the previous quarter in the 20 year par yield on gilts

TABLE A2.1: UNRESTRICTED MODEL OF TRANSACTIONS VOLUME

Dependent variable is the log of transactions deflated by the share price (LNVP)

The estimation period is 1964Q1 - 1984Q3

ORDINARY LEAST SQUARES

RIGHT-HAND VARIABLE	(lag)	ESTIMATED COEFFICIENT	T-STATISTIC
CONST.		-0.22	-0.30
LNVP	(-1)	0.52	3.88
LNVP	(-2)	0.05	0.32
LNVP	(-3)	0.06	0.44
LNVP	(-4)	-0.07	-0.56
LTC		-0.51	-1.99
LTC	(-1)	0.74	2.32
LTC	(-2)	-1.03	-2.31
LTC	(-3)	-0.03	-0.08
LTC	(-4)	0.06	0.20
DUM3		-0.10	-2.15
Q1CGT		0.12	1.49
PDOT		0.45	1.85
PDOT	(-1)	0.65	2.19
PDOT	(-2)	-0.39	-1.14
PDOT	(-3)	0.35	1.04
PDOT	(-4)	-0.00	-0.01
LPC		1.30	1.94
LPC	(-1)	-2.71	-2.00
LPC	(-2)	2.36	1.73
LPC	(-3)	-0.93	-0.76
LPC	(-4)	0.28	0.48
ABSPDT		0.60	1.59
ABSPDT	(-1)	-0.77	-2.21
ABSPDT	(-2)	0.47	1.25
ABSPDT	(-3)	-0.03	-0.07
ABSPDT	(-4)	-0.04	-0.01
LNIP		0.27	1.41
LNIP	(-1)	0.09	0.54
LNIP	(-2)	-0.04	-0.22
LNIP	(-3)	-0.01	-0.07
LNIP	(-4)	0.04	0.22
LTP		0.05	1.06
LTP	(-1)	0.01	0.17
LTP	(-2)	-0.02	-0.40
LTP	(-3)	0.01	0.31
LTP	(-4)	0.01	0.31

Goodness of Fit

$\bar{R}^2$: 0.824
Amemiya's Prediction Criterion: 0.766
Log-likelihood: 88.548
Standard error as a % of the mean of the dependent variable: 2.3%

Figures in brackets are 95% signficance levels or the theoretical figures for a normal distribution.

Autocorrelation

Lagrange multiplier $\chi^2(1)$ 0.01 (3.84)
$\chi^2(4)$ 12.53 (9.4)
Godfrey Tremayne 4th order version of Durbin's h = 1.504

Normality of Residuals

Skewness - 0.588 (0)
Kurtosis 3.479 (3)

TABLE A2.2: PREFERRED MODEL OF TRANSACTIONS VOLUME

Dependent variable is LNVP

The estimation period is 1964Q1 - 1984Q3

ORDINARY LEAST SQUARES

RIGHT HAND VARIABLE	(lag)	ESTIMATED COEFFICIENT	T-STATISTIC
CONST		-0.27	-0.58
LNVP	(-1)	0.55	7.07
LTC		-0.48	-2.44
LTC	(-1)	0.74	2.95
LTC	(-2)	-1.01	-4.49
DUM3		-0.09	-2.87
Q1CGT		0.13	2.19
PDOT		0.53	2.87
PDOT	(-1)	0.57	3.46
PDOT	(-2)	-0.37	-2.11
PDOT	(-3)	0.43	2.87
LPC		1.36	3.13
LPC	(-1)	-2.45	-3.00
LPC	(-2)	1.38	3.13
ABSPDT		0.57	2.25
ABSPDT	(-1)	-0.77	-2.99
ABSPDT	(-2)	0.49	1.94
LNIP		0.34	4.29
LTP		0.06	2.05

Goodness of Fit

$\bar{R}^2$	0.865
Amemiya's prediction criterion	0.832
Log likelihood	85.266
Standard error as a % of mean of dependent variable	2.03%

Autocorrelation

L.M (1)	1.01 (3.84)
L.M (4)	11.34 (9.49)
Durbin's h	1.04
Godfrey-Tremayne 4th order version of h	2.055

Normality

Skewness	-0.502 (0)
Kurtosis	3.456 (3)

TABLE A2.3: LONG RUN ELASTICITIES: RECURSIVE ESTIMATES

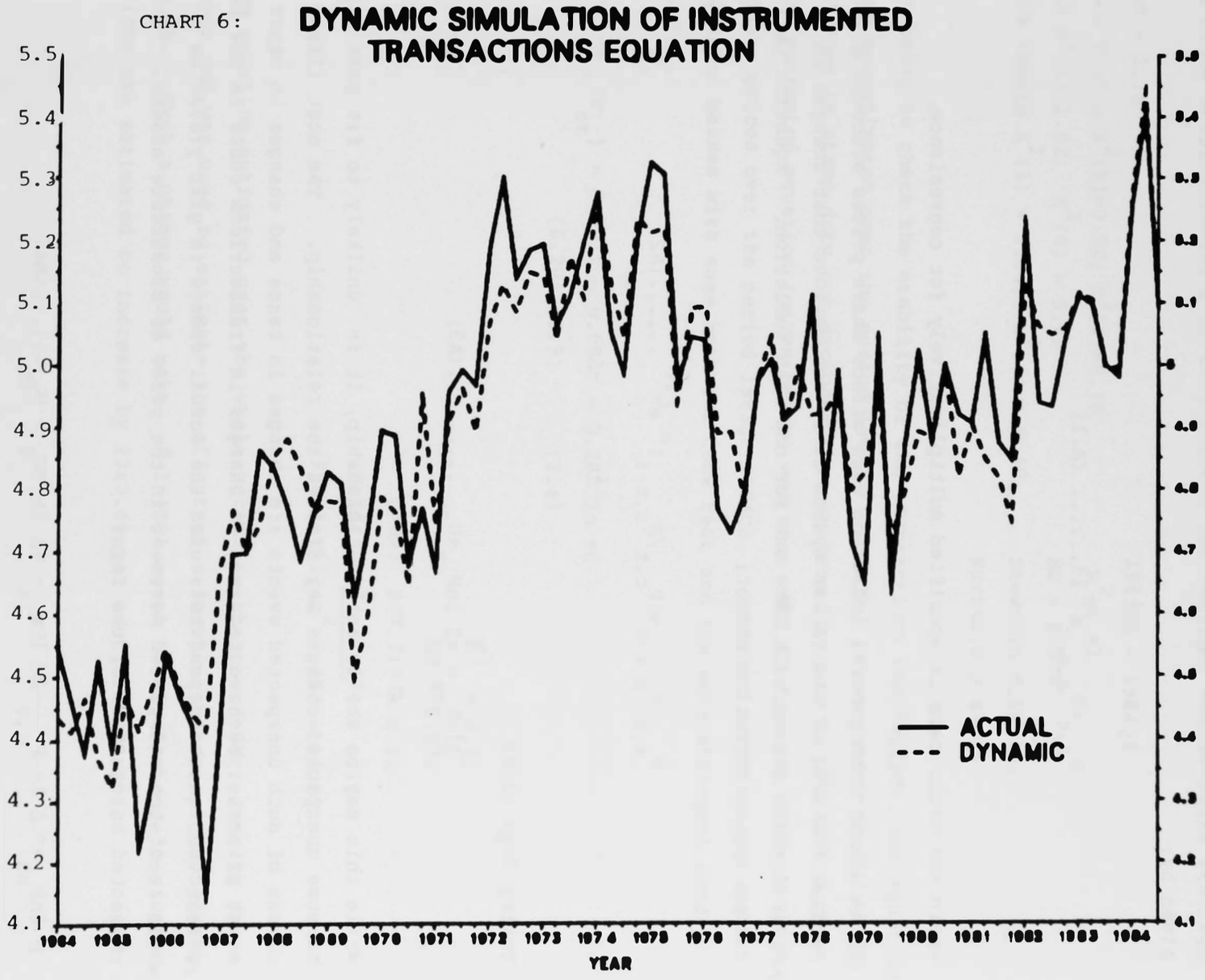
Recursive estimates of elasticities of the volume of transactions with respect to:

Start Year for Regressions	Capital Gains Effect	Increase in Prices	Fall in Prices	Size of Market	Net Inflows	Mergers	Transactions Costs
1964	0.28	3.20	-1.93	0.63	0.76	0.13	-1.65
1965	0.26	3.26	-1.87	0.63	0.71	0.12	-1.56
1966	0.29	3.07	-2.64	0.70	0.78	0.12	-1.75
1967	0.29	3.09	-1.94	0.56	0.70	0.10	-1.60
1968	0.26	2.90	-1.52	0.53	0.67	0.11	-1.50
1969	0.23	3.58	-0.95	0.39	0.56	0.14	-1.33
1970	0.26	4.07	-1.46	0.43	0.63	0.15	-1.49
1971	0.21	3.19	-0.72	0.36	0.53	0.13	-1.33

TABLE A2.4: OLS AND INSTRUMENTAL VARIABLES ESTIMATES

	Capital Gains Effect	Increase in Prices	Fall in Prices	Size of Market	Net Inflows	Mergers	Transactions Costs
OLS Estimates	0.29	3.22	-2.09	0.64	0.74	0.13	-1.62
Instrumental Variable Estimates	0.26	3.17	-1.07	0.59	0.81	0.14	-1.79

CHART 6:


DYNAMIC SIMULATION OF INSTRUMENTED TRANSACTIONS EQUATION
5.5
5.4
5.3
5.2
5.1
5.0
4.9
4.8
4.7
4.6
4.5
4.4
4.3
4.2
4.1
1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984
YEAR
ACTUAL
DYNAMIC

ANNEX 2

A SIMPLE MODEL OF SHARE PRICES

Rational expectations implies that share prices in a zero-inflation world are given by:

$$P_{s,t}=P_{s,t-1}e^{U}it..... \quad (A.1)$$

where the error term is specified multiplicatively for convenience.

It is likely that general inflation will affect share prices although given various features of the UK tax system it is not obvious that changes in nominal share prices will rise one for one with inflation. Equation (A2) allows for an inflation effect:

$$P_{s,t}/P_{s,t-1}=(P_{c,t}/P_{c,t-1})^{\alpha} e^{U2t} \quad .....(A2)$$

Taking logs gives

$$\Delta \ln P_{st}= \alpha\Delta \ln P_{ct}+U_{2t} \quad .....(A3)$$

While this may be the <u>ex ante</u> relationship, it is unlikely to fit past data because unexpected changes may distort the relationship. The most likely causes of such unexpected events are changes in taxes and changes in other asset prices. We have focussed on changes in transactions costs as the major unexpected tax change and have used the actual change in gilt yields as a measure of the unexpected movement in the price of substitute assets. This suggested an equation of the form:

$$\Delta \ln P_{st}=\alpha\Delta \ln P_{c,t}-\beta\Delta \ln r_{t}-\gamma\Delta \ln TC_{t}+U_{3t}.....(A4)$$

For empirical purposes, r is taken to be the par yield on a 20-year gilt, P_c is the consumer price deflator and TC denotes transactions costs. General unrestricted dynamic versions of (4) were estimated with error correction

terms but the preferred equation shown below, turned out to be extremely simple.

$$\Delta \ln(P_{st}/P_{ct}) = \underset{(0.21)}{0.0017} - \underset{(7.2)}{0.08}\Delta r - \underset{(2.4)}{0.23}\Delta \ln TC$$

DW = 1.76
Box Pierce $X^2(1)=0.98$; $X^2(4)=6.78$
LM $X^2(1)=1.02$; $X^2(4) = 9.49$
95% levels $X^2(1) = 3.84$; $X^2(4) = 8.40$

1963Q2 - 1984Q3
$R^2=0.41$
SE = 0.074
Skewness 0.18 (0)
Kurtosis 2.43 (3)

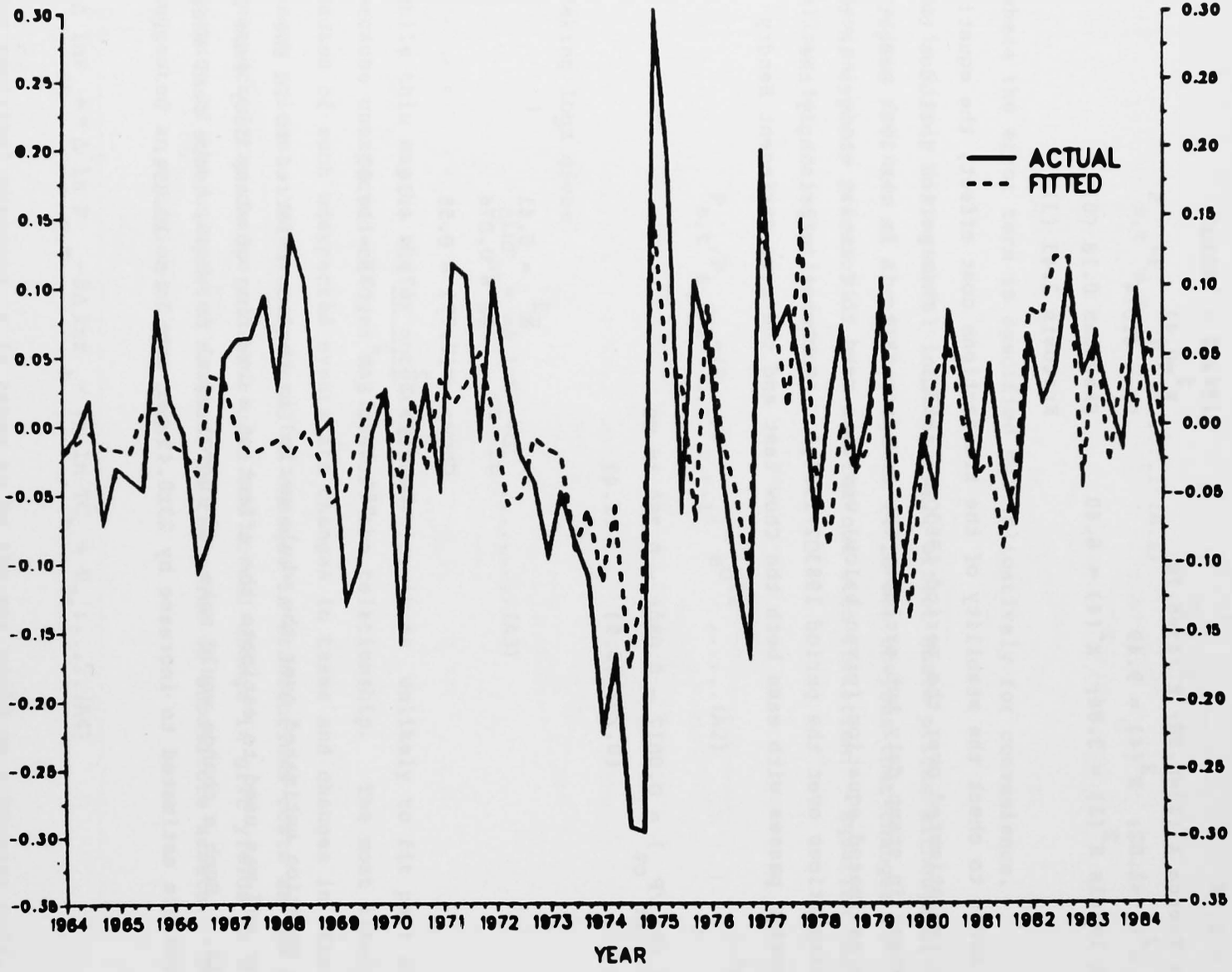
In order to check the stability of the transactions cost effect, the equation was re-estimated over the period 1963Q2 - 1983Q1. This period includes two changes in stamp duty but excludes the cut from 2% to 1% in the 1984 Budget. The estimated equation (given below) was then used to forecast changes in real equity prices over the period 1983Q2-1984Q3. Somewhat surprisingly the equation passes with ease both the Chow test and the more stringent Hendry test.

$$\Delta \ln (P_{st}/P_{ct}) = \underset{(0.20)}{0.0017} - \underset{(6.9)}{0.08}\Delta r - \underset{(2.4)}{0.28}\Delta \ln TC$$

$\bar{R}^2 = 0.41$
SE = 0.076
Chow: $F(7.77) = 0.55$
Hendry: $X^2 \quad (7) = 4.16$
95% level, $X^2 \quad (7) = 14.07$

The equation estimated over the whole period is the one referred to in the paper and was used to estimate the effect of a lowering of stamp duty from 2% to 1%. Such a change would make $\Delta \ln(TC)$ equal to -0.45, hence real share prices are estimated to increase by 23x0.45 per cent, ie 10.35%.

CHART 7: **REAL SHARE PRICES ACTUAL v FITTED**



ANNEX 3

Data Sources

	Definition	Source
Transactions (V)	The value of equity transactions on which stamp duty is paid	Inland Revenue (unpublished)
Share Price index (P_s)	FT all share price index	Financial Statistics (Table 13.7, series AJMA)
Market Size (TQ)	The market value of equities quoted on the London Stock Exchange	Annual Abstract of Statistics, Table 17.11
LAPFs' Inflows (NI)	Net inflows to Life Assurance and Pension Funds	Financial Statistics (Table 7.1 series AALV)
Gilt yields (r)	20-year par yield on UK gilts	Financial Statistics (Table 13.5 series AJLX)
Mergers and acquisitions (M)	Total expenditure on acquisitions and mergers of industrial and commercial companies within the United Kingdom	Financial Statistics (Table 8.8 series AIHB)

Bank of England Discussion Papers

	Title	Author
1-5, 8, 11-14, 16-17, 21&22	*These papers are now out of print, but photocopies can be obtained from University Microfilms International (see below).*	
6	'Real' national saving and its sectoral composition	C T Taylor A R Threadgold
7	The direction of causality between the exchange rate, prices and money	C A Enoch
9	The sterling/dollar rate in the floating rate period: the role of money, prices and intervention	I D Saville
10	Bank lending and the money supply	B J Moore A R Threadgold
15	Influences on the profitability of twenty-two industrial sectors	N P Williams
18	Two studies of commodity price behaviour: Interrelationships between commodity prices	Mrs J L Hedges
	Short-run pricing behaviour in commodity markets	C A Enoch
19	Unobserved components, signal extraction and relationships between macroeconomic time series	T C Mills
20	A portfolio model of domestic and external financial markets	C B Briault Dr S K Howson
23	A model of the building society sector	J B Wilcox
24	The importance of interest rates in five macroeconomic models	W W Easton
25	The efects of stamp duty on equity transactions and prices in the UK Stock Exchange	Mrs P D Jackson A T O'Donnell

Papers presented to the Panel of Academic Consultants[a]

	Title	Author
8	International monetary arrangements the limits to planning*	P M Oppenheimer
9	Institutions in the financial markets: questions, and some tentative answers*	M V Posner
10	The arguments for and against protectionism*	M Fg Scott The Hon W A H Godley
14	The usefulness of macroeconomic models*	Prof W H Buiter T F Cripps Prof Angus Deaton Prof A P L Minford M V Posner
15	Factors underlying the recent recession*	G D N Worswick Dr A Budd
17	Why do forecasts differ?*	Prof M J Artis
19	Bank lending, monetary control and funding policy*	Prof A D Bain
20	The economics of pension arrangements*	Prof Harold Rose J A Kay
22	Monetary trends in the United Kingdom	Prof A J Brown Prof D F Hendry and N R Ericsson
23	The UK economic recovery in the 1930s	G D N Worswick P N Sedgwick Prof Michael Beenstock Dr Forrest Capie Prof Brian Griffiths
24	Employment, real wages and unemployment in the United Kingdom*	Prof J R Sargent Sir Bryan Hopkin

Technical Series

1	The consumption function in macroeconomic models: a comparative study*	E P Davis
2	Growth coefficients in error correction and autoregressive distributed lag models	K D Patterson
3	Composite monetary indicators for the United Kingdom; construction and empirical analysis*	T C Mills
4	The impact of exchange rate variability on international trade flows*	G Justice
5	Trade in manufactures*	A C Hotson K L Gardiner
6	A recursive model of personal sector expenditure and accumulation*	E P Davis
7	A dynamic 'translog' model of substitution technologies in UK manufacturing industry	D J Asteraki
8	Financial asset portfolio allocation by industrial and commercial companies*	Mrs P D Jackson
9	Some properties of the Bank model*	G P Dunn N H Jenkinson I M Michael G Midgley
10	Asset demands and interest rate setting equations in imperfect markets*	C J Green
11	Exchange rate variability: evidence for the period 1973 — 1982*	D G Barr
12	The development of expectations generating schemes which are asymptotically rational	K D Patterson

* These papers are no longer available from the Bank, but photocopies can be obtained from University Microfilms International, at White Swan House, Godstone, Surrey, RH9 8LW.

(a) Other papers in this series were not distributed.