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(In)accuracy of a European political stock market: The influence of common value structures

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Abstract

This paper presents the results of a political stock market in the Netherlands: PAM94. The exchange covered three consecutive elections, allowing trade on five different markets. The predictions at PAM94 appear to be less accurate than those of previous markets of comparable size. Of the possible explanations that we examine, one in particular survives closer scrutiny. It concerns a type of judgement failure related to the winner's curse in common value auctions. Theoretical as well as empirical support is offered. Apart from qualifying the attractiveness of such markets as an alternative for opinion polls, this explanation may also be relevant for the analysis of other asset markets. Moreover, this judgement failure may be more important for European political stock markets than for the U.S., because the structure of the common values (vote shares) at multiparty elections make them especially vulnerable to it. © 2000 Elsevier Science B.V. All rights reserved.

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1. Introduction

In the first political stock market (PSM), concerning the U.S. presidential election of 1988, it was found that the closing prices of this market were very accurate predictors of the actual vote shares of the presidential candidates (Forsythe et al., 1992).¹ Averaged over the candidates, prices were only 0.2% points away from the actual vote shares and were much closer to the vote shares than the opinion polls (see Table 1). The fact that this market performed so well has led to the suggestion that PSMs could be used as an alternative or complement to opinion polls. Not only might they be more accurate, they are also cheaper to carry out, and they may provide a barometer of public opinion on a continuous basis.

This encouraging result is also of substantial economic interest. A prime concern of economists is the efficiency of financial markets. An important component of market efficiency is informational efficiency. Do markets aggregate and disseminate all available relevant information? Unfortunately, most financial markets offer little scope to test for market efficiency. One of the difficulties is that the ‘true’ underlying value of many assets never reveals itself to be compared with its price. In PSMs, however, the underlying value of each asset reveals itself on election day and can be compared to its price. If all relevant information is dispersed among the traders, market efficiency requires that closing prices are equal to the actual vote shares.

Even those sceptical of the availability of all relevant information among traders or the possibility of the market to aggregate and disseminate this information, might become believers by looking at the results of the four largest PSMs presented in Table 1. The closing prices at these markets are very close to the actual vote shares. The mean absolute errors are between 0.2% and 0.5% points, while the polls missed the results by more than 2%-points on average and circa 1%-point at best. Of course, these are still only four observations.² Hence, an important issue is whether these results are general. One feature of the four markets in Table 1 is that they are all North American. It is possible that differences in political institutional structure and culture affect the performance of PSMs. This may be of special relevance for those who want to use PSMs as an alternative or complement to opinion polls.

¹ A Political Stock Market is a computerized double auction market, where securities represent (groups of) political parties in an election. A share is attributed value by a payoff scheme that is determined by the election outcome for the party (or group of parties) represented. For more detailed information, also concerning the importance of the study of these markets as an alternative to opinion polls and to provide insight into the functioning of financial markets, see Forsythe et al. (1992).

² More recently, a PSM was organized for the 1996 presidential elections in the United States. To date, no report on this market has appeared, however.

Table 1
The four largest political stock markets ^a

Market	Opening date	Closing date	# Securities	# Traders ^b	\$ Volume of trade	m.a.e. ^c market	m.a.e. ^c polls	m.a.e. ^c best poll
U.S., President, 1988	June 1	Nov. 9	4	125	4,967	0.2	2.7	1.3
U.S., Senate, 1990 (IOWA)	June 12	Nov. 7	2	119	1,114	0.3	2.3	0.9
U.S., President, 1992 ^d	Jan. 10	Nov. 4	4	585	20,532	0.2	2.0	1.2
Canada, Federal, 1993 ^e	Sept. 13	Oct. 24	6	102	4,105	0.5	1.1	1.1

^a The data presented are based on personal correspondence with Forrest Nelson and Tom Ross.

^b Traders involved in at least one transaction.

^c Mean absolute error.

^d This consisted of two markets. One for Bush vs. Clinton and one for Perot vs. Democratic and Republican nominees.

^e Popular vote.

In this paper, we present the results of a large scale political stock market in the Netherlands: PAM94. Apart from being a useful replication, the fact that until 1994 PSMs of proportional representation systems had been small scale markets provided a major reason to organize this market. In many European countries, the political institutions are different from those in the U.S. For example, proportional representation generally yields more parties and a larger spread in party size than the U.S. winner-takes-all system does. Moreover, turnout is typically higher than in the U.S.

The Amsterdam PSM was open January–June 1994. It covered three consecutive elections, allowing trade on 5 different markets. The sequential nature of PAM94 – a new feature of PSMs – enabled traders to be experienced by the time they started trading for the second or third election. Nevertheless, according to our results, PAM94 appears to be less accurate in predicting the election outcome than markets of comparable size in the past. Moreover, it appears to be the first large scale market that did not predict the election outcome better than the polls did. Various possible explanations for this relative inaccuracy are examined in this paper. Only one possible explanation survives closer scrutiny. It concerns a type of judgment failure related to the ‘winner’s curse’ in common value auctions. In this explanation, the common value structure of the contracts, determined by the number of contracts and their relative values (given by the election outcomes), plays a crucial role. The upshot is that small values will be over-priced, and large values under-priced. Moreover, a positive relationship is predicted between the equality of the distribution of the common values and the predictive power of the market prices. The results of PSMs offer empirical support for this hypothesis. Our findings suggest that the much more equal distribution of common values in the U.S. market, in comparison with the markets of PAM94, may (at least partly) account for the better predictions by the market reported by Forsythe et al. (1992).

The organization of the paper is as follows. Section 2 describes the setup of PAM94, and presents some general results showing that it was less accurate in predicting the election outcome than comparable PSMs in the past. Section 3 elaborates on the outcomes and discusses some possible explanations, based on a replication of analyses by Forsythe et al. (1992). As these explanations, concerning the influence of polls and political preferences, are unsatisfactory, two alternative explanations are explored in Section 4. One of these concerns the impact of common value structures referred to above. Section 5 summarizes and concludes.

2. Organization and general results

We used the same basic software to run these experiments as has been used in previous PSMs (see Forsythe et al. (1992), or Berg et al. (1996) for more details).

Table 2
The markets on PAM94

Market	Opening date ^a	Election date	Securities ^b	# Traders ^c	\$ Volume of trade ^d
Municipal Council, party choice (MC-pc)	Jan. 24	March 3	GL, PvdA, D66, CDA, VVD, Reli, CD, Other	69	1,753
Second Chamber, party choice (SC-pc)	Feb. 8	May 3	GL, PvdA, D66, CDA, VVD, GPV, SGP, RPF, CD, Other	279	25,032
Second Chamber, turnout (SC-t)	April 6	May 3	Vote (%-turnout), Novote (%-abstention)	90	2,429
European Parliament, party choice (EP-pc)	Feb. 8	June 9	GL, PvdA, D66, CDA, VVD, Reli, Other	132	7,863
European Parliament, turnout (EP-t)	May 11	June 9	Vote (%-turnout), Novote (%-abstention)	46	3,386

^a Markets closed on the morning *after* election day, except EP-pc and EP-t, which closed on 12 June, the day the results were announced. Shares were liquidated and the revenues were added to the cash accounts.

^b For party labels, see Appendix.

^c Traders involved in at least one trade.

^d The currency used for trading was the Dutch guilder (at the time \$1 = DFL 1.75, approximately). For expositional reasons figures are presented in U.S. dollars.

The language used was Dutch, however. PAM94 covered 5 markets and 3 elections. The elections concerned the Municipal Councils (MC), the Second Chamber (SC), and the European Parliament (EP). For each election there was a ‘party choice’ market pertaining to the aggregate, national, election outcomes (to be denoted by MC-pc, SC-pc, and EP-pc). In addition, a ‘turnout’ market was organized for the Second Chamber election (SC-t) and the European Parliament election (EP-t). Outcomes for these markets were determined by the percentage of those eligible to vote who actually voted. Table 2 presents some key data concerning the five markets of PAM94.

A total of 484 traders signed up for PAM94. Total investment in the market was \$31,626. Forsythe et al. (1994) argued that some 100 active traders are a sufficient number for closing prices at a political stock market on average to be at least within 0.8%-points of the actual vote shares. The markets of PAM94 seem large and active enough to expect results compatible with the larger previous PSMs. The fact that SC-pc has more traders and more activity than the other four markets at PAM94 is no surprise. Berg et al. (1996) find a positive correlation between market activity and the political importance of an election (national vs. primaries). SC is generally considered to be the most important election and receives much more media attention than MC and EP. Furthermore, party choice (pc) is considered to be politically more important than voter

turnout (t). Finally, the fact that MC-pc is a less active market than EP-pc cannot be attributed to media attention or political interest, but seems mainly due to the fact that EP-pc was open for a much longer period of time.

To the best of our knowledge, the Second Chamber party choice market (SC-pc) is the second in size to date with respect to the number of active traders, and the biggest in terms of volume of trade. The trade volume of over \$25,000 for SC-pc implies that this volume is about 9 times the value of shares in circulation, on a yearly basis. This makes the market more active than any existing financial market we know of. Trade volume is not evenly distributed, however. About 40% of the active buyers and 20% of the active sellers are responsible for 90% of the volume of shares that was bought and sold, respectively. This still amounts to 112 buyers and 56 sellers.³

Traders in PAM94 were recruited nationwide through public announcements. The most important announcement was on a newsprogram on national television (NOVA) that later gave a weekly overview of the market prices. To acquire background information on the trader population, we conducted a written survey. It turns out that 96% of the 304 traders responding to the survey was male. The age was between 15 and 74, with an average of 37. 16% of these traders was a student and 77% had a regular job. Of the traders with a job, 61% worked in the private sector. 68% of the traders had a college or university degree and 74% earned more than the modal Dutch income. Only 9.5% had previous experience in stock markets. Finally, 85% of the traders used a modem or internet connection to trade on the market from outside of the University of Amsterdam.

All in all our traders are not a random sample of the voting population. However, this is not necessary, since the personal preferences of traders are not at stake (Forsythe et al., 1994). Like the traders in Forsythe et al. (1992), our traders can be characterized as males with high education and high income. Given the analysis of Forsythe et al. (1994) mentioned above, we see no reason to expect a less or more accurate prediction from this set of traders than in previous markets.

The main variables of interest in PSMs are the closing prices. A measure for the relationship between closing prices and election outcomes is the mean absolute prediction error (m.a.e.), defined as the absolute difference in %-points between closing prices (at 8.00 am on election day) and vote shares, averaged over the different parties. For each of the markets at PAM94, Table 3 presents the closing prices, the election outcomes, and, where available, the final polls by the two major polling agencies, InterView (IV) and NIPO. The final column

³ Unfortunately, we do not have data concerning the concentration of trade in previous PSMs to compare our results with.

Table 3
Market and election outcomes

Market ^a	Outcome	GL	PvdA	D66	CDA	VVD	Reli	GPV	RPF	SGP	CD	Other	Vote	Novote	m.a.e. ^b
MC-pc ^c	Election	5.6	17.0	11.1	21.5	15.6	5.5	—	—	—	2.1	21.6	—	—	0.0
	PAM94	5.6	17.5	15.7	21.0	16.4	5.0	—	—	—	2.8	16.3	—	—	1.6
SC-pc	Election	3.5	24.0	15.5	22.2	19.9	—	1.3	1.8	1.7	2.5	7.6	—	—	0.0
	PAM94	5.7	22.5	17.1	22.0	17.7	—	1.9	2.1	2.1	3.2	6.1	—	—	1.1
SC-t	NIPO ^d	5.3	22.4	17.0	20.1	18.3	—	2.1	2.3	2.5	1.6	8.4	—	—	1.2
	IV ^e	5.1	23.1	18.2	20.8	18.9	—	2.0	2.0	2.0	2.4	5.5	—	—	1.1
EP-pc ^c	Election	—	—	—	—	—	—	—	—	—	—	—	78.3	21.7	0.0
	PAM94	—	—	—	—	—	—	—	—	—	—	—	77.3 ^f	24.4 ^f	1.9
EP-t	IV	—	—	—	—	—	—	—	—	—	—	—	80.0 ^g	20.0 ^g	1.7
	PAM94	3.7	22.9	11.7	30.8	17.9	7.8	—	—	—	—	5.2	—	—	0.0
EP-t	Election	6.0	22.9	15.9	23.6	19.1	6.6	—	—	—	—	6.0	—	—	2.4
	PAM94	—	—	—	—	—	—	—	—	—	—	—	35.6	64.4	0.0
		—	—	—	—	—	—	—	—	—	—	—	44.4	56.3	8.5

^a See Table 2 for a definition of the abbreviations.

^b Mean absolute error.

^c The opinion polls did not provide predictions for the Municipal and European elections. They only published results of polls referring to the Second Chamber before these two elections.

^d Published 2 May.

^e Published 29 April.

^f The sum of these prices is 101.7. This is possible, because not all transactions take place simultaneously. As is common in reporting on PSMs, we have not rescaled the prices.

^g Obtained from the news release by ANP on 4 May. This is the only point prediction we are aware of. On 29 April IV predicted a turnout in the range 74–82%.

gives the mean absolute error. The m.a.e. at PAM94 ranges from 1.1 (SC-pc) to 8.5 (EP-t). The market with the largest number of traders (279), SC-pc, is also the most accurate, and the market with the smallest number of traders (46) is the least accurate.

To evaluate the predictive accuracy of PAM94, two comparisons can be made. First, predictive accuracy can be compared with those of other PSMs. Second, the markets' predictions can be compared to opinion polls. A mean absolute error of 8.5 like in EP-t is not unprecedented. One of the markets in the U.S. reported in Berg et al. (1996) also had a m.a.e. of 8.6. This market (Michigan primary) had a number of traders which was comparable to EP-t. The most successful market at PAM94 was SC-pc with a m.a.e. of 1.1, whereas the most successful in the U.S. were the presidential election markets of 1988 and 1992 with a m.a.e. of 0.2. The North-American markets which have a trading volume or a number of traders comparable to the markets at PAM94 have a m.a.e. which varies between 0.2 and 0.5. For the markets at PAM94 the m.a.e. varies between 1.1 and 8.5.

Opinion polls are available only for SC-pc and SC-t. Table 3 indicates that in both cases the final polls have a m.a.e. which is almost identical to those of the markets.⁴ In contrast, the North-American markets reported in Table 1 outperform the polls by a substantial margin. The prediction errors of even the best polls are about 2–6 times as large as those of the markets. It should be noted here that the results of Dutch opinion polls are published in a different way than seems to hold for the U.S. The raw data are corrected in some secret way before being made public. The correction method is a trade secret distinguishing one polling agency from the other. This may partly explain why Dutch polls often predict the outcome more accurately than agencies in other countries. Another explanatory factor may be the relative large turnout in Dutch national elections. Nevertheless, though Dutch polls are often found to be more accurate than the average poll in the U.S., they are not better than the best U.S. polls. And even the latter predicted less accurately than the U.S. market.

All in all, the markets at PAM94 were less accurate in predicting the election outcome than the North-American markets would have led one to believe. The mean absolute prediction errors are larger than those of previous PSMs of comparable size. Moreover, the markets at PAM94 for which polling data are available did not predict better than these polls, in contrast to previous large PSMs which outperformed even the best polls by a substantial margin. As its inaccuracy does not appear to be a consequence of a low level of activity we shall take a closer look at the results in the following sections. We shall start by replicating some of the analyses of Forsythe et al. (1992) in Section 3. This

⁴ If we compare the polls with the market prices on the day the former were published, a similar result is obtained.

allows us to compare trader behavior in our markets with that in the more successful U.S. market of 1988. In doing so, we shall concentrate on the SC-pc market, both because it was the largest, and because polling data are available.

3. An analysis of the results

The analysis of our results is undertaken in various steps. To get an impression of the market performance, we first look at the price formation over time and relate this to various events, including the publication of polls (Section 3.1). We shall then systematically investigate various potential explanations for the relative inaccuracy of PAM94.

3.1. *Price formation over time*

Fig. 1a–j present the closing prices for the 10 contracts on the SC-pc market. The following aspects are worth noting. First of all, for all parties the market is outside the interval spanned by the two opinion polls for at least some of the time. This is also observed in previous PSMs. For GL, PvdA, CDA, and SGP this occurred for long intervals. For the CDA traders were right to think that the polls were overestimating the fall (from 35.3% in the previous Second Chamber election to 22.2% in this election). Three drops in the price of CDA can be attributed to events in the campaign. On 7 March the chairman of the CDA stepped down, taking responsibility for some ill-fated CDA policy proposals concerning social security. Around 6 April opinion polls put the CDA in fourth place for the first time in history. After a slight recovery, some remarks by the former leader Lubbers – who accused the PvdA of a shift to the left – caused a new decrease around 13 April. Subsequently, the polls moved in opposite directions and ended up with about the same prediction, while the market went to a stable price very close to the actual outcome. Another interesting result concerns the PvdA. In all polls and local elections since 1989 this party had shown a rather steady decline in popularity. As Fig. 1b shows, the market picked up the turning point (around 1 April), before the polls did.

Besides these ‘success’ stories, the market was also led astray on various occasions. Note, for instance, the sharp decline in the price of D66 in Fig. 1c. It started a few days before the municipal elections, and was reinforced by D66’s share of votes in this election. This development, which actually brought the price close to the election result, was not picked up by either poll (NIPO started and stayed at a low level, whereas IV showed a slight drop, but not of the magnitude shown by the market). However, after this drop prices first rose and then moved up and down a bit, but never returned to the level of the beginning of March. Surprisingly, the decline of the D66 price around the municipal elections was only observed in SC-pc. In MC-pc there was no reaction.

Fig. 1. Closing prices and opinion polls.

1f: GPV

1g: RPF

1h: SGP

1i: CD

1j: Other

Fig. 1. Continued.

On a more general level, note that PAM94 and the polls of NIPO and IV were on the same side of the election outcome in eight out of the ten cases (all three either over- or underestimated the result). PAM94 had the best and the worst prediction in two of them, and was in between the two polls in the other four cases. In the next subsection we investigate the relationship between the poll results and the market prices in greater detail. Finally, it is noteworthy that PAM94 underestimated the result for the top 3 contracts in size and overestimated the result for the smallest 5 contracts. Only the intermediate cases, D66 and Other, do not fit into this picture. In Section 4 we return to this outcome and present an explanation.

3.2. Influence of the opinion polls

Forsythe et al. (1992) provide evidence rejecting the hypothesis that polls drive the market. It is not clear whether this conclusion can be carried over to PAM94, however. Fig. 1 suggests that in some cases the market did react to polls, whereas on other occasions it did not. Apparently, only some polls were considered to be informative. In this subsection we take a closer look at the influence of the polls. As noted in Section 2, Dutch poll results are published in a different way than in the U.S. If the Dutch polls capture all relevant information, than there is little reason to expect the PSM to predict better than the polls. In that case, one difference between PAM94 and other large markets – the fact that it was the first large market that did not outperform the polls – is then simply due to the good performance of the polls.⁵

A first indication of the effect of polls is the level of market activity after the release of a poll. It appears that some poll releases are indeed accompanied by a substantial increase in market activity. To investigate whether polls affected market prices, we replicate the causality test that led Forsythe et al. (1992) to reject the hypothesis that polls are driving the market. The test is meant to capture the extent to which market prices are affected by unexpected poll results (containing news). The model underlying the test is represented by the following equations (see Forsythe et al., 1992, p. 1151):

$$M_t = E_t(M_t|\varphi_{t-1}) + \sum_i \beta_i [P_{i,t} - E_t(P_{i,t}|\varphi_{t-1})] D_{i,t} + u_t, \quad (1)$$

$$E_t(M_t|\varphi_{t-1}) = \alpha_0 + \alpha_1 M_{t-1} + \alpha_2 M_{t-2}, \quad (2)$$

$$E_t(P_{i,t}|\varphi_{t-1}) = \gamma_{i,0} + \gamma_{i,1} P_{i,t-s} + \gamma_{i,2} (M_{t-1} - M_{t-s}). \quad (3)$$

⁵ Of course, this does not explain the relative inaccuracy of the market. Moreover, note that the Canadian polls were as accurate as the Dutch ones (cf. Table 1), whereas the error of the Canadian market was lower.

In these equations the subscripts t , s , and i , respectively, indicate the day of measurement, the number of days since the previous poll, and the polling agency (in our case $i = \text{NIPO, IV}$). Furthermore, M_t represents the closing (i.e., last trade) market prices, P_t is the outcome of a poll on the day of release, E_t is an expectation operator, D_t is a dummy variable indicating whether or not a poll is released on t , φ_t stands for all the information available at t , and u_t is white noise. The α 's, β 's, and γ 's are parameters to be estimated.

Eq. (1) describes how market prices depend on expected prices and unexpected poll results. Eqs. (2) and (3) model the expectation formation process concerning prices and polls. A rejection of the hypothesis $\beta_i \leq 0$ would indicate that unexpected results of the polls organized by agency i affect market prices in the direction of the polls. We estimated Eqs. (1)–(3) for each party separately.⁶ Table 4 presents the estimates of β and the corresponding t -values for the entire period of the SC-pc market (in which 25 polls were released), as well as for the period after the municipal elections (the closing of the MC-pc market; in this period 18 polls were released).

For the entire period it turns out that the IV polls had a statistically significant impact on the market prices of five parties (at a 5%-level), while the hypothesis that the NIPO polls had no impact cannot be rejected.⁷ However, it turns out that the mean absolute prediction error for the five parties (contracts) where the IV polls had an effect is 0.88 for PAM94, 1.08 for IV, and 1.38 for NIPO. Therefore, even though polls affected market prices, this effect cannot explain the relatively weak performance of the market. When the period after the municipal elections is considered, only four contracts are affected (including a new one). For these contracts the mean absolute prediction error is, again, smallest for the market (0.975 for PAM94, 1.125 for IV, and 1.35 for NIPO).

Thus, it can be concluded that polls did affect market prices⁸ but this influence cannot explain the relative inaccuracy of PAM94. The latter conclusion is based on the better performance of the market where the (IV) polls had an effect. On the other hand, the results of Forsythe et al. (1992) – showing no significant influence of polls – indicate that the poorer performance of PAM94

⁶ It might be better to estimate the 10 equations simultaneously, taking account of the restriction across equations. However, this restriction is not exact, because at any point in time the last trading prices can add up to less or more than one. Therefore, we chose to estimate the equations separately, using least squares (as in Forsythe et al., 1992).

⁷ The difference between IV and NIPO is not so surprising when looking at the responses by traders to a survey question that we posed. When asked which polls they kept track of, 58.8% responded with InterView, 4.6% with NIPO, 21.1% with both and 15.5% with neither.

⁸ Note from the results in Table 4 for the period after 2 March that a major poll surprise of 5% had an estimated effect of only about 1–1.5 cents on the securities significantly affected by the (IV) polls. A similar effect is observed by Forsythe et al. (1994) for the Canadian market.

Table 4
The influence of polls ^a

	GL	PvdA	D66	CDA	VVD	GPV	RPF	SGP	CD	Other
NIPO	0.10 (0.71)	– 0.05 (0.57)	0.09 (0.30)	0.05 (0.40)	0.06 (0.40)	0.04 (0.40)	0.11 (0.98)	– 0.20 (1.38)	0.15 (1.23)	0.11 (0.72)
IV	0.08 (0.61)	0.29 (2.82)	0.36 (2.10)	0.31 (3.67)	0.10 (1.00)	– 0.05 (0.14)	– 0.08 (0.15)	0.76 (2.23)	0.26 (2.05)	– 0.06 (0.37)
NIPO after 2 March	0.08 (0.52)	– 0.02 (0.22)	0.30 (0.96)	0.14 (1.11)	0.13 (0.69)	0.02 (0.19)	0.11 (0.76)	– 0.04 (0.21)	0.21 (2.02)	0.18 (1.58)
IV after 2 March	0.04 (0.22)	0.22 (2.38)	0.32 (1.83)	0.37 (3.55)	0.08 (0.77)	0.07 (0.28)	0.14 (0.26)	0.69 (1.38)	0.26 (2.39)	0.32 (2.65)

^a Each cell shows the estimate of the coefficient β_i in Eq. (1). The corresponding absolute t -value is presented within parentheses. Estimates in bold are statistically significant at the 5%-level. See the Appendix for party labels.

regarding the remaining contracts need not be related to the fact that polls were not used as a source of information here.

3.3. *Partisan trading and price biases*

Perhaps prices were more strongly affected by the ‘false-consensus effect’ mentioned by Forsythe et al. (1992, p. 1154). This occurs when individuals overestimate the extent to which their views are representative of the population. As a consequence, individuals with a preference for a particular election outcome tend to overestimate the likelihood of that outcome. In a political stock market, partisan traders would tend to buy larger stock of their preferred candidate or party and, hence, provide an upward pressure on the price of the contract concerned. In the American market it was found, for instance, that average net purchases (across active days) by Bush supporters were 1.12 for Bush stock and -1.59 for Dukakis stock, whereas a reverse pattern was observed for Dukakis supporters.

There are two ways in which a false-consensus effect may have had a negative impact on the relative performance of the Dutch market. Firstly, the effect may have been more severe, and, secondly, traders at this market may have formed a more biased sample of the total electorate. To enable a more or less direct comparison, we will examine this type of judgment bias along the lines of Forsythe et al. (1992). Political preferences were obtained from the questionnaire. The response rate allowed us to determine the political preferences of 178 of the 278 active traders.⁹ Our analysis focuses on the five major parties, as 170 of the 178 responders claimed to have voted for one of these parties. For each party we computed the net purchases by day across all traders in the share concerned that, respectively, voted and did not vote for that party. The first and third row of Table 5 present the mean values of these net purchases across all days. The last row but one gives the *t*-test statistic for equality of means (with unequal variances) between the two groups of traders.

For three of the five parties (PvdA, CDA, and VVD) it turns out that traders who stated to have voted for that party bought significantly more of its shares. For two parties (GL and D66) we find an opposite effect, with net purchases being larger for those who voted for other parties, but this effect is much less pronounced and statistically insignificant. Hence, it can be concluded that political preferences (partisan trading) also played a role at PAM94. However, because the significance levels and the magnitude of the effect seem comparable

⁹ The difference with the figure of 279 mentioned in Table 2 is due to a participant who started trading after 8.00 am on election day, at which time the closing prices (relevant for the price bias) were determined.

Table 5
Average net purchases by political preference ^a

	Party				
	GL	PvdA	D66	CDA	VVD
Average of net purchases, voted for party	– 0.50 (16.43)	1.11 (5.06)	– 0.29 (3.68)	1.79 (6.06)	0.94 (6.66)
Average of net purchases, voted for another party	– 0.11 (1.53)	– 0.61 (2.36)	0.01 (1.76)	– 0.10 (0.61)	– 0.26 (1.88)
<i>t</i> -test statistic	– 0.33 [0.74]	4.56 [0.00]	– 1.02 [0.31]	2.51 [0.02]	2.28 [0.03]

^a U.S. dollars (\$1 = DFL 1.75). Standard deviation between (), two-tailed significance level between [].

Table 6
Relation between sample bias and price bias

Party	Trader preference frequency	Trader preference percentage	Vote share	Trader preference bias	Price bias
GL	16	9.0	3.5	5.5	2.2
PvdA	56	31.4	24.0	7.4	– 1.5
D66	47	26.4	15.5	10.9	1.6
CDA	14	7.9	22.2	– 14.3	– 0.2
VVD	37	20.8	19.9	0.9	– 2.2

with the findings of Forsythe et al. (1992), it is hard to believe that that this could explain the relatively poor performance of the Dutch market as a predictor of the election outcome. In fact, the best prediction was obtained for the party showing the strongest effect (CDA).

We now turn to the second possibility that the inaccuracy is due to the fact that traders constituted a more biased sample of the population than in the American market. Table 6 relates the sample bias to the price bias for the five largest parties. The first and second columns give the absolute frequency of the traders' party preferences (party choice at the SC-election) and the corresponding fractions of the total response, respectively. The third column shows the election outcome (vote share). The fourth column gives the difference between columns two and three, illustrating the sample bias. And the last column shows the difference between the closing price of the SC-pc market and the election outcome (the price bias). The figures show a relatively large trader

preference bias. Forsythe et al. (1992) report an average trader preference bias for Bush vs. Dukakis of about 2.5%-points (see their Table 1), whereas for the five largest parties at PAM94 we find an average trader preference bias of about 8%-points. In particular, there is over-representation of D66 voters and under-representation of CDA voters in the market. Moreover, for these parties the sample bias is in the same direction as the price bias. On the other hand, the PvdA voters were overrepresented by 7.4%-points in our market but PAM94 underpredicted the PvdA result by 1.5%-points. On the whole, there is little indication of a systematic correlation between these two biases. For only half of all parties the price bias is in the same direction as the sample bias. Furthermore, for the three parties with a substantial number of constituents represented among the traders (PvdA, D66, VVD) this only holds in one case.

Additional doubt on the explanation that the relatively weak performance of the Dutch market is related to political preferences follows from the combined evidence of Tables 5 and 6. Table 5 shows that the strongest partisan trading was by traders who voted for PvdA, VVD, and CDA. According to Table 6, the constituents of the first two parties were also over-represented in the market. Nevertheless, this table shows that the price bias for these parties is in the 'wrong' direction. Hence, it is highly unlikely that price biases due to partisan trading and an unrepresentative sample of traders can account for the differences between the market (closing) prices and the election outcomes.

This subsection corroborated the finding of Forsythe et al. (1992) that traders are a biased sample of the electorate and are likely to back up their political preferences with partisan trading. On the other hand, it appeared that the combined effect is hardly detectable in the prices of the political stock market. In order to explain the relatively poor performance of PAM94 we have to look in a different direction, therefore.

4. Arbitrage opportunities and judgment failure

Having ruled out the influence of polls and the false-consensus effect as explanations, we now look at two other possibilities. The first considers rationality at the individual level. As Oliven and Rietz (1995), we consider the possibility that traders are missing arbitrage opportunities (Section 4.1). The other explanation we explore is that the institutional structure of the Dutch elections, combined with a specific kind of judgment failure, can account for our results (Section 4.2).

4.1. Arbitrage opportunities

Using data from the 1992 PSM for the presidential elections in the U.S., Oliven and Rietz (1995) address the question whether markets can be 'strong

form efficient' (implying an accurate prediction of the election outcome) whilst violating weaker forms of efficiency. By the latter, these authors mean the violation of simple arbitrage opportunities. They conclude that the 1992 PSM was very efficient in spite of frequent violations of arbitrage. They distinguish 'market making behavior' (setting the highest bid or lowest ask) from 'price taking behavior' (accepting a highest bid or lowest ask). Whereas arbitrage possibilities are violated in 5.4% of the market making actions, they are violated in 37.7% of the price taking actions. Oliven and Rietz go on to argue that 'active, knowledgeable, experienced and educated market makers with large orders can drive prices to efficient levels while profiting from other (price-taking) traders' mistakes' (p. 14). Hence, subjects missing arbitrage opportunities need not imply inaccuracy of the market.

As Oliven and Rietz, we consider missed arbitrage opportunities in PAM94. We focus on price taking actions (trades), because arbitrage in market making actions is very difficult to realize with a large number of contracts. An arbitrage opportunity is missed when a trader buys stock in the market while the ask price of the contract wanted together with the sum of the bid prices of the other contracts exceeds one. In that case it would have been cheaper to buy one or more unit portfolios – one share of each contract, costing exactly 1 guilder – and sell the shares not wanted. Similarly, a transaction (trader) missed an arbitrage opportunity when a contract is sold in the market and its bid price together with the sum of the ask prices of the other contracts is below one. Although the effect of these trades on prices may only be temporary, it might influence the market prediction if the trading volume related to this type of transactions is large.¹⁰

Attention is again focused on the SC-pc market, but similar results are obtained for the other markets. We first measure the violations of arbitrage by the percentage of missed opportunities, the corresponding trade volume and the number of traders involved. For each trader we evaluated every transaction¹¹ of which (s)he was the initiator. Table 7 shows the results.

In about 10% of the total number of transactions, arbitrage possibilities were missed. These transactions were not extremely large or small because the related trade volume was not much different. Most of the traders (64.2%) missed an opportunity at least once. A closer look at the data reveals that around 50% of the traders missed an arbitrage opportunity in at least 10% of their transactions. However, the total amount of money missed is only about \$182 (0.7% of the

¹⁰ It should be noted that we may be overestimating the number of arbitrage opportunities in this way, because there is a (small) risk that a trader is confronted with changes in bid or ask prices while (s)he is buying or selling a group of securities one at a time. Nevertheless, because these trades do not seem to explain the relative inaccuracy of PAM94, we shall not elaborate on the role of this risk.

¹¹ Results are basically the same when orders, instead of transactions, are used for the evaluation.

Table 7
Frequency of missed arbitrage opportunities

	All transactions	Transactions with missed arbitrage opportunity
Number	11,262	1,155 (10.3%)
Number of traders involved	285	183 (64.2%)
Trade volume (\$) ^a	49,618	4,168 (8.4%)

^a Includes unit portfolios bought from or sold to the exchange.

money invested in this market). Hence, the financial importance of these trades is relatively small.

Nevertheless, since many traders were involved in many of these transactions, it is interesting to investigate the relationship between the percentage of this type of transactions in each contract and the relative (absolute) prediction error of PAM94. Table 8 provides evidence on the percentage of transactions with missed arbitrage opportunities (column 2) and the error in the prediction (columns 5 and 6). Note that the party with the highest percentage of missed arbitrage exhibits the lowest relative error (CDA) and that the party with the lowest percentage exhibits the highest absolute error (GPV). The results presented in the table do not provide any evidence for a positive relationship between these two variables (the Spearman rank-order correlation coefficient is equal to -0.66).¹² We conclude, therefore, that these missed arbitrage opportunities cannot explain the relatively poor performance of PAM94 either.

4.2. *Overconfidence and the structure of values*

A well-documented empirical and experimental result in common value auctions is that bidding behavior is characterized by a judgmental failure which leads to the so-called winner's curse (e.g., Kagel and Levin, 1986). Bidders tend to be overconfident and put too much weight on their own information and judgement (see Heath and Tversky, 1991). Note that there is a clear common value element in a PSM, because the election outcome determining the value of the party contracts is common.

In this section we discuss a static model of a political stock market which sheds light on the consequences for PSMs of this type of judgmental failure in

¹² We also investigated the number of missed arbitrage opportunities for each party during the last two trading days. While hectic trading took place on these days, only four transactions of this kind occurred, however.

Table 8
Missed arbitrage and prediction errors

Party	% Missed arbitrage	Election outcome	PAM94 outcome	Absolute error	Rel. abs. error (%)
GL	11.1	3.5	5.7	2.2	62.9
PvdA	15.0	24.0	22.5	1.5	6.3
D66	14.7	15.5	17.1	1.6	10.3
CDA	15.4	22.2	22.0	0.2	0.9
VVD	11.2	19.9	17.7	2.2	11.1
GPV	3.9	1.3	1.9	0.6	46.2
RPF	8.6	1.8	2.1	0.3	16.7
SGP	4.8	1.7	2.1	0.4	23.5
CD	11.1	2.5	3.2	0.7	28.0
Other	15.7	7.6	6.1	1.5	19.7

combination with cash constrained traders.¹³ In the model traders neglect the fact that a low price for a party indicates that other traders do not have very favorable information about that party. They rely too heavily on their own private information. As a consequence, the average trader buys too much of the relatively 'cheap' contracts (parties) and too little of the relatively 'expensive' contracts. This yields underpricing of parties with favorable electoral prospects and overpricing of those with bad prospects.¹⁴

As in common value auctions, suppose that trades are motivated not by differences in taste, but by differences in information about the electoral prospects of the two parties P_1 and P_2 . Let v ($1 - v$) be the unknown true vote share of P_1 (P_2).¹⁵ Assume that v is a random draw from the uniform distribution on $[0, 1]$, and that each trader i receives a private signal s_i which is a random draw from the uniform distribution on $[v - \varepsilon, v + \varepsilon]$.¹⁶ Each trader then has a piece of private information (s_i) which (s)he knows to be an unbiased estimate of v . On the basis of his private information trader i expects one share of party P_1 to yield

¹³ It should be noted, however, that the judgment failure that we assume in the market model is somewhat stronger than the one needed to derive a winner's curse in an auction model. In both models traders neglect to condition their behavior on an event revealing information about the private information of other traders. In the auction model this event (winning the auction) has yet to take place, whereas in the market model this event (price formation) is readily observable.

¹⁴ The model, although static in nature, allows for a dynamic or ongoing trade interpretation.
¹⁵ To bring out the intuition as clearly as possible we will consider a market with two parties. For a more formal exposition and for extensions, see Potters and Wit (1995b).

¹⁶ The exact analytical result depends on the specific distribution imposed. Therefore, we examined several other (non-uniform) distributions of the private information signal. It appears that the implications of the model survive these other distributional assumptions.

a payoff of s_i at election day, and a share of party P_2 to yield $1 - s_i$. Hence, if trader i is risk neutral and bases trades solely on his private information then (s)he will buy shares of party P_1 if the market price $p_1 < s_i$ and shares of party P_2 if the market price $p_2 < 1 - s_i$. Define $p := p_1 = 1 - p_2$. Hence, trader i will buy shares of P_1 if $s_i > p$ and buy shares of P_2 if $s_i < p$.

In equilibrium, p must be such that the excess demands for shares of P_1 and P_2 are zero. For the political stock market this implies that the demand for shares of P_1 and P_2 must be equal, because supply is always equal across portfolios. To derive this equilibrium price we assume that all N traders have the same money endowment E . A trader with private information such that $s_i > p$ will then buy E/p shares of P_1 , and a trader with $s_i < p$ will buy $E/(1 - p)$ shares of P_2 . If n_1 is the fraction of traders with a signal $s_i > p$ and n_2 the fraction of traders with a signal $s_i < p$ then the equilibrium price p must solve

$$n_1 \frac{E}{p} = n_2 \frac{E}{1 - p}. \quad (4)$$

Of course, n_1 and n_2 depend on p . As p decreases (increases) more (fewer) buyers will buy P_1 . More precisely, $n_1 = \text{Prob}(s_i > p) = 1 - \text{Prob}(s_i < p) = 1 - n_2$. Under the maintained assumption about the distribution of s_i it follows easily that with a large number of traders we have

$$n_1 = 1 - n_2 = \text{Prob}(s_1 > p) = \frac{v + \varepsilon - p}{2\varepsilon}. \quad (5)$$

By substituting Eq. (5) into Eq. (4) and solving for p , we find

$$p = \frac{v + \varepsilon}{1 + 2\varepsilon}. \quad (6)$$

This yields a number of interesting results. First, the good news is that there is a positive relation between the market price p (for P_1) and the true vote share $v = v_1$. Furthermore, the price correctly indicates who will win the election: $p > 1/2$ if and only if $v > 1/2$. This prediction is unambiguously born out by the results of the PSMs. The second result of our model is less favorable for the predictive accuracy of the market. The equilibrium price gives a correct prediction of the vote shares only if the true vote shares of the two parties are equal: $p = v$ if and only if $v = 1/2$. Otherwise, the party with the larger vote share will be underpriced and the party with the smaller vote share will be overpriced. For example, suppose that $v_1 = v > 1/2$. Then the model predicts that $p_1 = p < v = v_1$ and $p_2 = 1 - p > 1 - v = v_2$. These implications are supported by the two turnout markets at PAM94. Table 3 shows that in both cases the asset with the largest value (Vote at SC-t and Novote at EP-t) is underpriced.

We do not have an analytical result for a model with more than two parties. Extensive simulations, however, indicate that the model then consistently

predicts a negative correlation between the true vote shares v_i and the price biases $p_i - v_i$ (for $i = 1, \dots, K$, and K the number of parties). Hence, it is predicted that relatively large parties will be under-priced and relatively small parties will be over-priced. Again this prediction is supported by the markets at PAM94 as well as by the markets shown in Table 1. The (Pearson) correlation coefficients between vote share and price bias is consistently negative for all of these larger markets.¹⁷

How these price biases may affect the average predictive accuracy is suggested by the final results of the model. By Eq. (6), for a market with two contracts the m.a.e. is equal to $\frac{1}{2}|p_1 - v_1| + \frac{1}{2}|p_2 - v_2| = \frac{1}{2}|p - v| + \frac{1}{2}|(1 - p) - (1 - v)| = |p - v| = (2\varepsilon/(1 + 2\varepsilon))|v - \frac{1}{2}|$. This gives two comparative statics results. First, the m.a.e. will increase with ε , that is, if the information set from which traders receive their signals becomes more coarse. Put differently, if traders tend to disagree more on the vote shares, then *ceteris paribus* market prices are likely to be less accurate on average. Second, the m.a.e. increases with $|v_1 - v_2| = |v - (1 - v)| = 2|v - \frac{1}{2}|$. If the vote shares become more unequal (move further away from $\frac{1}{2}$) then *ceteris paribus* the m.a.e. increases. However, it is difficult to generalize this latter result to markets with more than two parties. The precise theoretical relationship between the structure of the vote shares and the mean prediction error is not easily specified. Nevertheless, simulations unambiguously suggest that there is a negative relationship between the predictive accuracy of the market (m.a.e.), and the inequality of the structure of the vote shares (captured for instance by a Theil coefficient¹⁸).

It is not possible to formally test these comparative statics results. Contrary to the previous result – a negative correlation between vote share and price bias – such tests require comparisons across different markets. Nevertheless, some results are noteworthy. First, at PAM94 both party choice (pc) and turnout (t) are predicted more accurately by the SC markets than the EP markets. The fact that no opinion polls are available for the latter markets is consistent with our theoretical result that the m.a.e. increases if the traders have more coarse information. Similarly, Berg et al. (1996) find market predictions to be more accurate when the election is considered to be more important and receives more media attention. Second, Berg et al. (1996) find that the number of contracts (parties) has a significantly negative effect on predictive accuracy. They conjecture that an election outcome is harder to predict when there are

¹⁷ The same applies to most, but not all, of the smaller markets in the U.S. (Berg et al., 1996) and Europe (Forsythe et al., 1993).

¹⁸ For PSMs the Theil coefficient can be defined as $T = \sum_{i=1}^N v_i \ln(Kv_i)$, where K is the number of parties. The minimum value is attained when all the parties are equally sized ($T = 0$ if $v_i = 1/K$ for all i), and the maximum value is attained when one party receives all the votes ($T = 1$ if $v_i = 1$ for some i , and $v_j = 0$ for $j \neq i$).

more parties. Our SC-pc market has more parties (10) than any of the large scale North-American PSMs, which could be part of the explanation of its relative inaccuracy. At the same time, however, the SC-pc has a much more unequal distribution of vote shares (common values). For example, the Theil coefficient is 0.41 whereas it is 0.16 on average for the markets in Table 1. Perhaps this could be an alternative explanation. Remarkably, for the markets considered in Berg et al. (1996), both the Theil coefficient and the number of candidates are positively correlated with the m.a.e. However, they are also strongly correlated with each other (0.87). Hence, as our theoretical model would suggest, perhaps it is not merely the number of candidates that causes this effect, but also the spread in the relative values of the candidates. To be able to separate out these different effects it would be necessary to perform a careful econometric analysis, which includes data on a substantial number of large markets (price biases, number of traders, volume of trade, number of contracts, equality of vote shares, opinion polls, etc.). Unfortunately, not enough large PSMs have been run for such an analysis.

All in all, our results suggest that the structure of the common values (vote shares) – that is, the number of contracts and their relative values – has an effect on the price biases and, hence, on the mean prediction error. This result is especially interesting if we want to make conjectures about the predictive performance of political stock markets for different electoral systems. This is discussed in the following section.

5. Concluding remarks

In this paper we analyzed the results of the first large scale European political stock market. The five markets of PAM94 replicated a number of findings of other PSMs, such as a tendency for larger markets to perform better, and that polls and political preferences do not dominate the price formation. However, the mean absolute prediction error was larger than in other markets of comparable size. Moreover, even the largest market (with a larger trade volume than any previous PSM) did not perform better than the polls. Several possible explanations for the relative inaccuracy of PAM94 were examined, but rejected.

One explanation that survived concerns a type of judgment failure that is related to the winner's curse in common value auctions. More specifically, if traders put too much weight on their own private information, then there will be a tendency for relatively small parties to be over-priced and for large parties to be under-priced. Theoretical as well as empirical support for this phenomenon was found, concerning both PAM94 and previous PSMs. Furthermore, an implication of these biases is that the (average) predictive accuracy of a market will decrease with the degree of inequality of the vote shares.

This inequality is related to the political system. A winner-takes-all election can be expected to move parties closer together than a proportional representation system does. Hence, election results for parties will be observed to be closer together. In proportional representation elections, typically more parties are involved. Therefore, we expect the price biases to be more pronounced in systems of proportional representation. As such, our results should be a matter of concern, especially for scholars interested in organizing a PSM to predict the election outcome in elections in Europe, where proportional representation is more common than in the U.S. This qualifies the use of a political stock market as an alternative for opinion polls. In our view it does not follow, however, that PSMs are useless as an instrument for predicting election outcomes. Apart from the advantages of these markets over polls, discussed in Forsythe et al. (1992), the bias discussed will be small in elections where parties are more or less equally sized. Nevertheless, it would be useful to search for institutional changes in the PSM design that might alleviate the problem.

For the economics of financial markets our results may have important implications as well. Our model suggests that the informational efficiency may sometimes be difficult to meet. Even with a large number of traders, who would have full information on the true underlying values if they could pool their information, prices may still not fully reflect these values if the traders are overconfident about their own private information. Moreover, in that case the price biases are likely to follow a particular pattern. A closer analysis of the price biases at a number of (large) PSMs revealed exactly this pattern: a negative correlation between vote shares and price biases. Interestingly, this pattern of price biases is not just typical for PSMs. On parimutual betting markets precisely the same bias is observed: the so-called favorite-longshot bias (Potters and Wit, 1995a). For other financial markets where ‘anomalies’ have been documented the reported judgment bias may have some relevance as well.

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Appendix A. Dutch politics

This appendix provides a brief description of Dutch parties. An extended version is available from the authors.

At present, the four major parties in the Netherlands are the following: the labor party **PvdA**, a social-democratic party; the christian democratic party **CDA**, a religious, centrist party; the right-wing liberal party **VVD**; and **D66** (as of 1966), a left-wing liberal party with a strong variation in electoral success. Of the smaller parties, the **Green Left (GL)** first participated in the 1989 Second Chamber election as a combination of three small left-wing parties. The parties known as the ‘small-right’ parties, can be divided into religious and non-religious parties. The former consist of the calvinist fundamentalist parties **SGP**, **GPV**, and, since 1981, the **RPF**. These parties are very much alike but differ as to the calvinist denomination they base themselves on. Finally, the thinly veiled racist party **CP** had a seat in the Second Chamber in the 1982–1986 period and since 1989 (though it changed its name to **CD**).¹⁹

In this paper, the **SGP**, **GPV**, and **RPF** are sometimes grouped together as ‘religious right’ (denoted by ‘**Reli**’). The larger parties **CDA**, **PvdA**, **VVD**, **D66** and **GL** are taken separately. All other parties, including local parties at local elections, are combined in the category ‘**Other**’, except the **CD** which is treated separately for the national elections.

References

- Berg, J., Forsythe, R., Rietz, Th., 1996. What makes markets predict well? Evidence from the Iowa electronic markets. In: Güth, W. (Ed.), *Essays in Honor of Reinhard Selten*. Springer, Berlin forthcoming.

¹⁹ Besides these parties, various parties have obtained seats for one or two terms. Most noteworthy is that three new parties appeared in the Second Chamber in the 1994 elections discussed in this paper. Two of them represent the interests of the elderly, while the third is an extreme party on the left wing. These parties fall in the category ‘Other’ throughout this paper.

- Forsythe, R., Nelson, F., Neumann, G.R., Wright, J., 1992. Anatomy of an experimental political stock market. *American Economic Review* 82, 1142–1161.
- Forsythe, R., Nelson, F., Neumann, G., 1993. The Iowa political market. Mimeo. University of Iowa.
- Forsythe, R., Frank, M., Krishnamurthy, V., Ross T.W., 1994. Using market prices to predict election results: The 1993 UBC election stock market. Mimeo.
- Heath, C., Tversky, A., 1991. Preferences and belief: Ambiguity and competence in choice under uncertainty. *Journal of Risk and Uncertainty* 5, 5–28.
- Kagel, J.H., Levin, D., 1986. The winner's curse and public information in common value auctions. *American Economic Review* 76, 894–920.
- Oliven, K., Rietz, Th.A., 1995. Suckers are born but markets are made: Individual rationality, arbitrage and market efficiency on an electronics futures market. Mimeo.
- Potters, J., Wit, J., 1995a. Bets and bits: Favorite-longshot bias and winner's curse. Mimeo.
- Potters, J., Wit J., 1995b. Winner's curse in common value markets. Mimeo.