

# Economic Determinants of Public Opinion About Joining the EMU: The Case of Sweden

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## Abstract

A potential Swedish membership in the third stage of the EMU (the currency union) will be determined in a referendum. The opinion polls preceding this referendum show strong variability in the Swedish public opinion over the last four years. In this paper I derive a simple theoretical model and test it empirically to establish the economic factors driving the opinion. I find that an increase in the nominal exchange rate variability makes the opinion more in favor of membership, while the opposite is true for unemployment variability.

**Keywords:** Public opinion, referenda, monetary union

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# 1 Introduction

The introduction of the the third stage of the European Economic and Monetary Union (EMU) on January 1, 1999, is without a doubt one of the most far reaching integrating events on the European political arena. The EMU currently consists of 15 member states, of which 12 have formed a currency union with a common currency and a single monetary authority. Sweden is among the countries that stand closest to becoming members of the currency union is Sweden. A potential Swedish membership will ultimately be determined in a referendum. The opinion polls preceding this referendum reveal strong variability in the opinion over the last years. In this paper I derive a simple theoretical model and test it empirically to establish the economic factors driving the opinion.

The creation of EMU is primarily a political process heading towards deeper integration.<sup>1</sup> The desirability of this deeper integration therefore should be one important determinant of how the Swedish opinion will vote in the upcoming referendum. Furthermore, the introduction of the common currency and the common central bank is an institutional change that might induce changes in other areas of the economy, possibly more relevant for the individual. These might include co-ordination of fiscal policy and changes in the wage formation.

The stylized fact in Sweden is that public opinion on potential Swedish membership has been quite volatile. Assuming that individual preferences for deeper integration, increased co-ordination in fiscal policy and other institutional aspects are fairly stable over time, these factors cannot explain observed *fluctuations* in public opinion. Instead, I will argue that these opinion fluctuations depend on movements in relevant economic variables.

Formally, the third stage of EMU simply implies that national currencies are replaced by the common Euro and that the nominal interest rates previously determined by the national monetary authorities will be set by the common central bank. Therefore, reasoning strictly economically the effect each individual voter has to consider when casting his/her vote for or against the monetary union is whether or not the expected individual utility will be higher or lower with a common currency and a common nominal interest rate.

The main result in this paper is that a substantial part of the observed

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<sup>1</sup>See Feldstein (1997) and Wyplosz (1997).

variation in the Swedish public opinion can be explained by variability in the nominal exchange rate and in unemployment. Higher currency risk increases the support for membership, while the opposite pattern is true for the unemployment risk. Further, the support in Sweden for membership in the currency union is higher the weaker the Swedish Krona is against the Euro, and the higher the Swedish unemployment rate is. Interest rate differentials do not seem to have any significant effect on the opinion.

This paper is organized as follows. In Section 2, I derive a simple theoretical model used to illustrate how movements in economic variables may affect the opinion. The data used in this study is presented in Section 3. Using this data, the predictions from the theoretical model are then tested empirically in Sections 4 and 5. The paper ends with a concluding Section 6.

## 2 A theoretical illustration

Since the question of Swedish membership in the EMU will be decided in a referendum, the optimizing agents in a theoretical model are individuals maximizing their utility (or equivalently, minimizing their loss) by voting for or against membership in the union. I will illustrate the basic idea underlying this paper in a highly stylized model.

### 2.1 Assumptions

Assume a two-country world, where the world economy consists of a Home economy and a monetary union in the model denoted as Foreign. The size of the world economy is normalized to 1, with the size of Home equal to  $n$ . Throughout this section, Foreign variables will be marked with an asterisk. All individuals are workers relying only on labor income.

The log of output supply ( $y^s$ ) and demand ( $y^d$ ) in the Home economy are given by

$$y_t^s = l_t + z_t \quad \text{and} \quad y_t^d = m_t - p_t, \quad (1)$$

where  $l_t$  is employment,  $m_t$  is money supply and  $p_t$  is the price level in period  $t$ . All variables in the model are stated in natural logarithms. The supply of output is subject to stochastic zero-mean productivity shocks  $z_t$ . In the short run, output is determined from the demand side. Firms produce just enough

to meet this demand and employment in the Home economy is, therefore, found by equalizing supply and demand in (1) as

$$l_t = m_t - p_t - z_t. \quad (2)$$

It is assumed that the price level in the small open Home economy,  $p_t$ , is given by the purchasing power parity condition:

$$p_t = p_t^* + s_t, \quad (3)$$

where  $p_t^*$  is the price level in the Foreign economy and where  $s_t$  is the nominal exchange rate between Home and Foreign assumed to follow the stochastic process

$$s_t = s_{t-1} + \phi_t, \quad (4)$$

where  $\phi_t$  is a zero-mean shock to the nominal exchange rate with variance  $\sigma_\phi^2$ .

In order to keep the model as simple as possible, I abstain from modelling the wage-setting mechanism in the economy. Assume instead that nominal wages for period  $t$  are predetermined in period  $t - 1$ , and that the level of the nominal wage is not a choice variable for the individual. Intuitively, this assumption is employed to capture the fact that wages adjust more sluggishly than prices (in particular, than the nominal exchange rate). The period  $t$  real wage,  $\Omega_t$ , is therefore

$$\Omega_t = w_t - p_t, \quad (5)$$

where the nominal wage,  $w_t$ , is preset in period  $t - 1$ . That is, the nominal wage is set before the productivity and exchange rate shocks are realized.

The policy variable in the model is the money supply, set by a national monetary authority. Given the setup of the model, the price level in the small open economy is determined by the Foreign price level,  $p_t^*$ , and stochastic shocks to the nominal exchange rate,  $\phi_t$ . Therefore, in this single period model, Home monetary policy cannot affect the price level in the Home economy. Instead, the objective of the policy makers is full employment ( $l_t = 0$ ). The money supply is set after the realization of the shocks, and given the full employment target, optimal money supply equals

$$m_t = p_t^* + s_t + \theta_t. \quad (6)$$

Since the monetary authority does not face any uncertainty, it can always set money supply in a way that will restore full employment, as long as the

Home economy is not a member of the monetary union. The monetary rule is simply to accommodate both exchange rate and productivity shocks.

For each individual, the decision to join a monetary union is a trade-off between nominal and real risk. A convenient *ad hoc* way to state this is to assume that each individual's preference can be described by a loss function:<sup>2</sup>

$$L_t = E \left[ \left( \Omega_t - \hat{\Omega}_t \right)^2 + \lambda \left( l_t - \hat{l}_t \right)^2 \right], \quad (7)$$

where the terms  $\hat{\Omega}_t$  and  $\hat{l}_t$  denote the individual's period  $t$  target values for the real wage and employment, respectively, and where  $\lambda$  is a parameter measuring the relative weight the representative individual puts on employment stability. It is assumed that the individual's target level of employment is full employment,  $\hat{l}_t = 0$ . Nominal wages are set in period  $t - 1$  based on the expectation of the price level in order to fulfill the individual's real wage target,  $\hat{\Omega}_t$ . Hence

$$\hat{\Omega}_t = w_t - p_t^e, \quad (8)$$

where the price level expectation  $p_t^e = E[p_t | I_{t-1}]$  is rationally generated based on all information available in period  $t - 1$ ,  $I_{t-1}$ . Assuming that the individuals can perfectly predict the development of the MU price level,<sup>3</sup> from equation (3), we can then derive the following expression for the difference between actual and expected price level:

$$p_t - p_t^e = (p_t^* + s_t) - E(p_t^* + s_t) = \phi_t. \quad (9)$$

That is, all shocks to the Home price level, and hence to the real wage are connected to unexpected fluctuations in the nominal exchange rate.

## 2.2 Comparative statics

The purpose of this simple model is to illustrate how changes in economic variables may affect the individual's choice to vote for or against entrance into the monetary union. This will be done here by comparing the individual's loss under monetary independence to the monetary union case.

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<sup>2</sup>The expectations operator enters the expression, since the nominal wages are set before the realization of the shocks. Here, I do not allow for the possibility that the nominal wage setting could change with membership in the union. For a discussion on wage flexibility and membership in a monetary union, see Erlandsson (2002)

<sup>3</sup>This assumption is made out of convenience. The important assumption is that when comparing the outcomes under monetary independence and monetary union, the individuals' expectations on the foreign price level do not change.

### 2.2.1 Individual loss with monetary independence

Substituting the expressions (2), (5), (8) and (9) into the expected loss function (7), the loss with monetary independence is reduced to

$$L_t^{non-MU} = E \left[ \left( \Omega_t - \hat{\Omega}_t \right)^2 \right] = E \left( -\phi_t \right)^2 = \sigma_\phi^2. \quad (10)$$

Therefore, under the assumption that the Home monetary authority can set the money supply to always restore full employment, the loss for the individual when the Home economy is not a member of the monetary union is purely connected to the nominal exchange rate risk.

### 2.2.2 Individual loss in a monetary union

When the Home economy enters the monetary union, monetary policy will no longer be conducted by the national monetary authority, but instead by a union-wide authority. If the Home economy has entered into the union, total employment in the monetary union can be expressed as

$$l_t^{MU} = n l_t + (1 - n) l_t^* = m_t^{MU} - p_t^{MU} - z_t^{MU},$$

where  $l_t^*$  is Foreign employment and where the productivity shock is a weighted average of the shocks in the two economies:  $z_t^{MU} = n z_t + (1 - n) z_t^*$ . The policy rule restoring full employment then becomes  $m_t^{MU} = p_t^{MU} + z_t^{MU}$ . Substituting this expression into the expression for employment in the Home economy (2) gives that employment in the Home economy, once it is a member of the monetary union, is given by

$$l_t = m_t^{MU} - p_t^{MU} - z_t = (1 - n) (z_t^* - z_t). \quad (11)$$

By expressing the difference in productivity between the two economies as  $z_t^* - z_t = \theta_t$  the resulting expression for employment in the Home economy is

$$l_t = (1 - n) \theta_t.$$

Substituting this expression into the individual loss function, together with the fact that in a monetary union  $\phi_t = 0$ , gives

$$L_t^{MU} = E \left[ \lambda (1 - n)^2 (\theta_t)^2 \right] = \lambda (1 - n)^2 \sigma_\theta^2. \quad (12)$$

Theoretically, therefore, when voting for or against membership in a monetary union, an individual compares the respective loss functions, and a condition for voting "yes" would be that the loss from entering the union is smaller than the loss from staying independent. The formal way to say this would be  $L^{non-MU} - L^{MU} > 0$ . Using (10) and (12) this requirement becomes

$$\text{If } \begin{cases} \sigma_\phi^2 - \lambda(1-n)^2\sigma_\theta^2 > 0 & \text{then vote } Yes \\ \sigma_\phi^2 - \lambda(1-n)^2\sigma_\theta^2 \leq 0 & \text{then vote } No \end{cases} \quad (13)$$

That is, the larger the exchange rate risk and the smaller the employment risk, the more likely the individual is to vote for membership in the referendum. The more the individual values real side stability (the larger the parameter  $\lambda$ ), the more likely he/she is to vote against. Also, the smaller the Home country is compared to the monetary union, the more likely it is that the individuals will vote against membership, since in this simple model, the smaller the Home country is, the less the common monetary authority will react to the productivity shocks in the Home economy. The next step is to test this theoretical proposition empirically.

## 3 The data

### 3.1 The dependent variable

The poll data I use in this study is collected by five different opinion institutes. As is obvious in Figure 1, below the Swedish opinion has shown strong variability over the last years. The overall pattern is similar for the different institutes.

*Insert Figure 1 here*

I have included only those polls where I have been able to find information on the time period for the interviews. In all, I have 34 usable observations from Demoskop. The corresponding numbers from TEMO, Gallup and SIFO are 18, 23 and 17 observations, respectively, while Statistics Sweden (SCB) has undertaken opinion polls twice every year.<sup>4</sup> All together, I have 100 observations over the time period April 1998 to April 2002.

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<sup>4</sup>The first observation I use from Statistics Sweden I use is from May 1998. In all, I have 8 observations from Statistics Sweden.

The question asked in the opinion polls was:<sup>5</sup>

*In the EU a monetary union has been formed - the EMU - with a common currency, the Euro. If it today was a referendum on Swedish membership in the EMU, would you vote yes or no to Sweden entering into the EMU?*

Generally, the method in each poll was to use telephone interviews with a representative sample of about 1,000 Swedes aged 18-89 years. The collection period varied between two and fourteen days. The exception was SCB, each time making about 7,000 interviews over three weeks.

## 3.2 Explanatory variables

To measure currency uncertainty, I calculate the variance of the daily change in the log of the nominal exchange rate SEK/Euro over the last 15 months preceding each observation.<sup>6</sup> The unemployment uncertainty is measured as the variance of the unemployment rate for the same time period. For example, if the collection period was January 14-20, 2000, the variance of the nominal exchange rate is calculated from the daily observation made 15 months back from January 13, and the variance of unemployment is based on monthly observations from September 1998 to December 1999. For the exchange rate I use daily official data, while the unemployment rate is reported only on a monthly basis.

The level of the exchange rate and the unemployment rate did not come out as explanatory variables in the theoretical illustration above. Still, the level of the exchange rate may affect the level of the real wage and hence the consumption possibilities for an individual. This is also true for the rate of unemployment which is why I test both as potential explanatory variables.

Among the particular political and economic events that might affect the opinion, three events stand out as the most important. Firstly, a look at the poll data (Figure 1) indicates that there was a big jump in the opinion in January 1999. This was due to the actual introduction of the third stage of the EMU with a common currency and a common central bank, on January

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<sup>5</sup>There are some variants on this question. See Appendix for a full description of the questions.

<sup>6</sup>The reason for choosing 15 months is that it gives the best fit (highest  $R^2$ ). Using the variance over any number of months between 6 and 24 does not change the empirical results. When plotting the  $R^2$ 's from 6 to 24 months, the pattern is hump-shaped with a peak at 15 months.



1, 1999. From the data it seems that this effect was highly temporary and it is captured here by a dummy variable taking the value 1 for observations from January, 1999, and 0 otherwise. A similar effect is apparent for the beginning of 2002, when the Euro was replacing 12 national currencies. Although most likely,<sup>7</sup> it is not as obvious as in the former case that this effect was temporary. I therefore use a dummy for the of months January - April 2002 to cover this effect.<sup>8</sup>

The second major event was the Danish referendum on September 28, 2000, when the Danes decided not to join the EMU. This led to a big fall, also, in the support for Swedish membership.<sup>9</sup> From Figure 1 it is not obvious that this effect was as temporary as the effect of the introduction of the Euro. I therefore specify this variable as having a decaying effect on the opinion with  $DK_{mj} = (0.9)^m$ , where  $m$  is the number of months that have passed since the referendum in Denmark for each particular poll  $j$ .

The different opinion institutes may differ in the way they interpret the answers from the respondents. I therefore use dummy variables for each institute to prevent this from affecting the economic results.

## 4 Empirical results

### 4.1 An empirical model

In the theoretical part above it was shown that an increase in the exchange rate risk would increase the incentive for a voter to vote for membership in the monetary union, while the opposite was true for increased employment risk. Based on this, a general formulation of an evaluation function determining how individuals value economic factors for and against EMU is

$$f(X_j) = b_0 + b_1 Var(\Delta s_j) + b_2 Var(U_j) + b_3 Z_j \quad (14)$$

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<sup>7</sup>There was a tendency that the opinion for EMU entry was weakening in the beginning of April.

<sup>8</sup>The reason behind these jumps in the polls is a bit unclear. One possible explanation is the strong media focus that was connected to the two events, and in particular to the potential negative consequences of Sweden staying outside.

<sup>9</sup>Denmark, along with Norway, is Sweden's closest neighbor, geographically as well as economically and politically. Norway is not in the EU and with Denmark deciding not to enter the currency union, arguments were raised that a more well-suited currency union could be made among Sweden, Denmark and Norway.

where  $Var(\Delta s_j)$  is the variance of the daily change in the nominal exchange rate SEK/Euro.  $Var(U_j)$  is the variance of the unemployment rate and  $Z_j$  is a vector of potential additional explanatory variables.

The question asked in the polls forces people to make a discrete, qualitative choice. A voter's preference, however, is not a discrete "yes" or "no", but instead a continuous function of the economic outcome. To solve this, each individual  $i$ 's unobserved propensity in poll  $j$  to support Swedish membership in the EMU is indexed by  $YES_{ij}^*$  and is determined stochastically by

$$YES_{ij}^* = f(X_j) - \varepsilon_{ij} \quad (15)$$

where  $f(X_j)$  is the evaluation function given by (14) and where  $\varepsilon_{ij}$  are random events, specific to each individual at each poll, that decrease the support for Swedish membership.

Since  $YES_{ij}^*$  is an unobserved variable, it cannot be used as a dependent variable. Instead I introduce the observed binary variable  $YES_{ij}$ , where  $YES_{ij} = 1$  if individual  $i$  responds "yes" in opinion poll  $j$ , otherwise  $YES_{ij} = 0$ . In the regressions it is assumed that the individuals react homogenously to the economic variables,  $f(X_j)$ . Introducing a threshold,  $\tau$ , the variable  $YES_{ij}$  is defined as

$$YES_{ij} = \begin{cases} 1 & \text{if } YES_{ij}^* = f(X_j) - \varepsilon_{ij} \geq \tau \\ 0 & \text{if } YES_{ij}^* = f(X_j) - \varepsilon_{ij} < \tau \end{cases} \quad (16)$$

It is assumed that the random events  $\varepsilon_{ij}$  are drawn from a uniform distribution<sup>10</sup>, evenly distributed between  $a + \bar{\varepsilon}_j$  and  $c + \bar{\varepsilon}_j$ , where  $a < 0$  and  $c > 0$  are constants and where  $\bar{\varepsilon}_j$  is the conditional mean of  $\varepsilon_{ij}$  at each opinion poll  $j$ . The cumulative distribution of the random events can therefore be written

$$F(\varepsilon_{ij}) = \begin{cases} 0 & \text{for } \varepsilon_{ij} < a + \bar{\varepsilon}_j \\ \frac{\varepsilon_{ij} - a - \bar{\varepsilon}_j}{c - a} & \text{for } a + \bar{\varepsilon}_j \leq \varepsilon_{ij} \leq c + \bar{\varepsilon}_j \\ 1 & \text{for } \varepsilon_{ij} > c + \bar{\varepsilon}_j \end{cases} \quad (17)$$

Therefore, using only the intermediate values for  $F(\varepsilon_{ij})$  and equation (16),

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<sup>10</sup>Over the relevant range of outcomes for the dependent variable  $YES_{ij}^*$ , 30-55% the uniform distribution is similar to for example the normal or logistic distributions. For a discussion, see Fair (1976) or Hibbs (2001)

the linear vote probability function can be written

$$\begin{aligned}
\text{Prob}(YES_{ij} = 1) &= \text{Prob}(\varepsilon_{ij} \leq f(X_j) - \tau) \\
&= F(f(X_j) - \tau) \\
&= \frac{-a + f(X_j) - \tau - \bar{\varepsilon}_j}{c - a}
\end{aligned} \tag{18}$$

Aggregating over the voters  $i$  to find  $\frac{1}{N} \sum_1^N YES_{ij} = YES_j$  and using equation (15) we obtain

$$YES_j = -\frac{a + \tau}{c - a} + \frac{f(X_j)}{c - a} - \frac{\bar{\varepsilon}_j}{c - a} \tag{19}$$

Finally, writing the dependent variable as a percentage share, the model to estimate is obtained as

$$YS_j = \beta_0 + \beta_1 \text{Var}(\Delta s_j) + \beta_2 \text{Var}(U_j) + \beta_3 Z_j + v_j \tag{20}$$

where  $YS_j = 100 * YES_j$ ,  $\beta_0 = 100 * [-\frac{a + \tau - b_0}{c - a}]$ ,  $\beta_1 = 100 * \frac{b_1}{c - a}$ ,  $\beta_2 = 100 * \frac{b_2}{c - a}$ ,  $\beta_3 = 100 * \frac{b_3}{c - a}$  and  $v_t = -\frac{\bar{\varepsilon}_j}{c - a}$ .

## 4.2 Estimation using all observations

I start by estimating equation (20) using the share of all voters responding yes as the dependent variable.

The results in regression (1) give empirical support to the theoretical predictions derived in Section 2. Both the exchange rate and unemployment variances enter significantly with the expected signs. Using regression (1), an increase in the variance of the nominal exchange rate by one standard deviation would increase the support for Swedish membership by almost  $104.6 \times 0.044 = 4.6\%$ . The corresponding decrease in the support from increased unemployment risk is  $-20.2 \times 0.231 = -4.7\%$ . Hence, the public opinion in this issue seems as sensitive to real risk as to nominal risk, indicating a value of  $\lambda \approx 1$  for the weight parameter in the individual loss function (7).

The intuition of the exchange rate risk result is straightforward. Entrance in the union implies that Sweden will have the same currency as its main trading partners. The currency risk will therefore be substantially lower in the EMU.

Table 4.1 Dependent variable: Yes-share as part of all votes  
Time period: April 1998 - April 2002

variable	Regression			
	(1)	(2)	(3)	(4)
Exchange rate variance	104.6 (13.5)	83.8 (10.1)	65.2 (7.11)	61.1 (6.10)
Unemployment variance	-20.2 (-9.87)	-17.7 (-8.36)	-18.7 (-7.90)	-15.7 (-5.97)
log(SEK/Euro)			34.4 (4.08)	30.0 (3.55)
Unemployment			1.15 (1.73)	1.66 (1.96)
Interest rate spread				193.4 (1.32)
Monthly trend				0.092 (1.47)
Danish referendum		-4.13 (-4.00)	-3.65 (-2.59)	-3.33 (-2.27)
January 1999		5.54 (3.77)	5.00 (3.63)	6.55 (4.41)
Jan-April 2002		2.24 (1.54)	2.81 (2.05)	2.06 (1.47)
Constant	30.2 (22.7)	33.5 (24.9)	-43.7 (-2.28)	-42.5 (-2.19)
$\bar{R}^2$	0.70	0.77	0.80	0.81
Number of observations	100	100	100	100

*Note:* *t*-statistics for the parameter estimates in parentheses  
Results for the institution dummies are not reported, but can be obtained from the author upon request.

The interpretation of the unemployment risk result is perhaps less clear-cut, but intuitively one might think in the following way: Entrance in the monetary union will most probably not lead to less fluctuations in unemployment. When the unemployment variance increases in some period, then the individuals become more averse to even more fluctuations, therefore decreasing the incentive to vote yes.

Part of these effect can be explained by introducing the most important political events in regression (2). The Danish "no" lowered the support in Sweden by slightly more than 4% while the introduction of the common cur-

rency increased the support by some 5.5%. The effect of the actual introduction of the common currency in January 2002 is smaller and not significant. The main explanatory variables are still significant also when controlling for these political events<sup>11</sup>.

This is true also in regression (3), where the level of the nominal exchange rate is shown to significantly affect the opinion. The level of the exchange rate may affect the individual's consumption possibilities. Regression (3) indicates that the less valued the Swedish Krona is against the Euro, the more supportive is the opinion to a Swedish membership in the currency union. A 5% depreciation of the Krona increases the support by  $(34.4 \times 0.05 = 1.7\%)$ . The results in regression (3) also indicates that the support for membership increases in the unemployment level, although not significantly.

Entrance in the EMU implies that the nominal interest rates in Sweden will be more or less harmonized with the EMU interest rate. In regression (4) the interest rate spread, defined as  $i_t - i_t^*$ , where  $i_t$  is the Swedish long-run nominal interest rate and  $i_t^*$  is the EMU counterpart, is added as an explanatory variable. The expected effect is that a positive spread would increase the propensity to vote yes, since entrance in the EMU would force the domestic nominal interest rate to adjust to the EMU level. This expectation is met in regression (4), where the sign is positive, but where the standard error is high. The conclusion is that the nominal interest rate spread does not substantially affect the Swedish EMU opinion. In the last regression also a monthly trend is added. It indicates that over time more and more Swedes support entrance, but the result is not significant.

### 4.3 Leaving out the undecided voters

In the polls, the voters have the choice "don't know". In an upcoming referendum, there will (most probably) be only two alternatives, yes and no, but the number of non-participating voters might still affect the outcome of the referendum.

An estimation of equation (20) with the share of undecided voters as dependent variable show that there is a significant negative trend. The point

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<sup>11</sup>I have tested other possible control variables, such as media coverage and a dummy for the congress where the Social Democrat Party, the governing party in Sweden, decided to work for a Swedish membership in the union, but they turn out not to be significant. I have also tested using a lagged dependent variable, but that also does not come out significantly.

estimate (t-value) is  $-0.084$  ( $-3.70$ ) indicating that for each year about one per cent fewer Swedes answers "don't know". None of the other explanatory variables turn out to be significant<sup>12</sup>.

In Table 4.2 the undecided votes are disregarded and the dependent variable is the share of voters responding yes as part of those responding yes or no.

*Table 4.2* Dependent variable: Yes-share as part of the yes and no votes. Time period: April 1998 - April 2002

variable	Regression			
	(1)	(2)	(3)	(4)
Exchange rate variance	122.5 (14.2)	93.5 (11.1)	79.0 (8.39)	70.4 (6.90)
Unemployment variance	-22.7 (-9.94)	-19.2 (-8.93)	-21.6 (-8.87)	-18.8 (-7.00)
log(SEK/Euro)			31.2 (3.60)	26.7 (3.11)
Unemployment			1.72 (2.51)	1.74 (2.02)
Interest rate spread				329.5 (2.22)
Monthly trend				0.045 (0.71)
Danish referendum		-6.36 (-6.08)	-4.79 (-3.31)	-3.96 (-2.65)
January 1999		6.24 (4.19)	5.61 (3.98)	7.34 (4.86)
January-April 2002		2.99 (2.02)	3.73 (2.65)	3.24 (2.27)
Constant	34.4 (23.2)	39.2 (28.8)	-34.1 (-1.73)	-27.7 (-1.41)
$\bar{R}^2$	0.70	0.81	0.84	0.85
Number of observations	100	100	100	100

*Note:* *t*-statistics for the parameter estimates in parentheses

The results with the share of yes votes as a share of only the yes and no votes as dependent variable give similar results as did the results with the yes shares out of all votes as a dependent variable. The share of undecided voters is not sensitive to movements in the economic variables. It is therefore

<sup>12</sup>The results of these regressions are available upon request.

consistent that when the undecided voters are disregarded the effects from the economic variables and main control variables are magnified. The unemployment rate and the interest rate spread this time have significant effect on the opinion, while the trend effect weakens.

#### 4.4 Results using only the Demoskop observations.

As can be seen in Figure 1, the poll frequency is not equally spread over the sample period, with a majority of the polls undertaken during 1999 and 2000. This fact, that the polls are not equally spread over the period could potentially bias the results. In order to check this I once again run a regression based on equation (20), but now using only the polls from Demoskop, which is the most frequent collector, having undertaken polls more or less every month since January 1999.

*Table 4.3*

Dependent variable: Yes-share as part of the yes and no votes.  
Time period: January 1999- February 2002

variable	Regression		
	(1)	(2)	(3)
Exchange rate variance	142.1 (10.3)	121.1 (6.96)	94.9 (4.54)
Unemployment variance	-31.3 (-7.78)	-28.6 (-5.70)	-26.8 (-4.89)
SEK/Euro			34.8 (2.08)
Unemployment rate			1.13 (0.81)
Danish referendum		-3.82 (-1.99)	-4.36 (-1.42)
January 1999		6.36 (2.11)	5.76 (1.98)
January-April 2002		1.20 (0.41)	2.32 (0.82)
Constant	33.9 (15.9)	37.2 (15.5)	-40.1 (-1.05)
$\bar{R}^2$	0.77	0.81	0.82
Number of observations	34	34	34

*Note:* *t*-statistics for the parameter estimates in parentheses.

The results in Table 4.3 confirm the results obtained above, using data from all five poll institutes. Therefore, the previous results obtained are not biased due to an unfrequent distribution of the polls over time.

## **5 Explaining the opinion pattern in different income groups**

This far I have assumed that all individuals have identical preferences. In particular, the parameter  $\lambda$  in equation (7) does not vary between individuals. In reality, however, the support for Sweden joining the third stage of the EMU differs in most demographic dimensions. Generally, men are more positive to membership than women. High income groups are more positive than low income groups. There is also a geographic aspect where people living in larger cities are more pro-EMU than people on the countryside, and so on.

An analysis of how different demographic groups may react differently to nominal and real risk one would optimally be based on individual data, but that kind of data is not available. For some of the Demoskop polls, however, the company has provided me more detailed information. In those 22 polls the sample have been divided into three income categories, high, medium and low. In Table 6.1 below I have estimated equation (20) for the different income groups separately.



Table 5.1

Dependent variable: Yes-share as part of the yes and no votes. Time period: February 1999 - September 2001

variable	Regression		
	<i>High</i>	<i>Medium</i>	<i>Low</i>
Exchange rate variance	185.6 (4.25)	93.2 (2.14)	55.3 (1.32)
Unemployment variance	-35.9 (-2.85)	-24.0 (-1.93)	-20.9 (-1.74)
log(SEK/Euro)	-45.8 (-1.49)	18.2 (0.56)	47.8 (1.49)
Unemployment	1.83 (0.87)	4.34 (2.06)	3.63 (1.79)
Constant	147.7 (2.09)	-17.1 (-0.23)	-88.5 (-1.21)
$\bar{R}^2$	0.54	0.78	0.58
Number of observations	22	22	22

Note: *t*-statistics for the parameter estimates in parentheses

The three regressions for different income groups confirm the stylized fact that high income earners generally are more in favor of a Swedish membership in the EMU than low income earners are. Simply comparing coefficients, it also seems that the richer you are the more sensitive are you to nominal risk. A possible explanation for this is that non-labor income is more sensitive to nominal risks. Since high income earners have more wealth than low income earners, they thereby rely less heavily on labor income. One would have expected an opposite pattern for the real risk, but that result is not found in the data<sup>13</sup>. Although not significant, different income groups also seems to differ in the reaction to fluctuations in the nominal exchange rate, with the high income group being less prone to membership as the Swedish Krona devalues.

In the table 6.2 below I test the joint hypothesis that the high and low income groups react homogenously on "new" information. That is, I test the hypotheses that the parameters  $\beta_i^{high} = \beta_i^{low}$ , where  $i$  is the different variables in the regression above.

<sup>13</sup>Note that I have used the overall level of unemployment in the economy, when calculating the variance  $Var(U)$ . In a deeper analysis (if I could get additional information on more polls) the correct measure would be to use the unemployment in different income groups.

*Table 5.2* Test of significance that the parameters for high and low income groups are identical

Parameter	Significance level
Exchange rate variance	0.03557741
Unemployment variance	0.39153623
log(SEK/Euro)	0.04016990
Unemployment	0.53913425

Hence, the high income group is significantly more sensitive to nominal risk than the low income group. The response in the opinion on fluctuations in the nominal exchange rate also differs significantly between different income groups.

## 6 Conclusions

In Sweden, entrance in the EMU currency union will be decided in a referendum. The polls preceding the Swedish referendum show substantial variability in the public opinion. In this paper I have derived a theoretical illustration to show how economic variables, in particular the exchange risk and the unemployment risk affect individual's attitude to a Swedish membership.

Using opinion poll data, the empirical evidence strongly support the results in the theoretical model. Larger currency risk increases the support for Swedish membership. The opposite is true for unemployment risk, where increased variability in unemployment leads the opinion to be more skeptical to membership. The opinion pattern in Sweden differs among different income groups, with high income earners being more sensitive the nominal risk.

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## Appendix

### A Descriptive statistics

Table A.1 Some descriptive statistics

variable	Obs.	Mean	Std.Dev	Min	Max
yes	100	39.303	5.811	27.8	53
no	100	41.467	6.319	28	56
undec	100	19.081	5.995	10	30
exrate	1123	2.183	0.041	2.0879	2.2973
varexrate	1123	0.1680	0.0440	0.0982	0.2368
varunemp	1123	0.4323	0.2314	0.0585	0.8820

### B Question asked

Demoskop, Sifo, Gallup and SCB have all used the question cited in the text. The only exception is Temo, that up till February 2000 used the question.

*Sweden is on of the countries that are members of the EU, but not in the European Monetary Union, EMU. Do you think it would be good or not good for Sweden to be in EMU.*

..or in Swedish

*”Sverige är ett av de länder som är med i EU men inte i den europeiska moneära unionen, EMU. Anser Du att det vore bra eller dåligt för Sverige att vara med i EMU-samarbetet?”*

After February 2000, Temo used the same question as the other institutes.

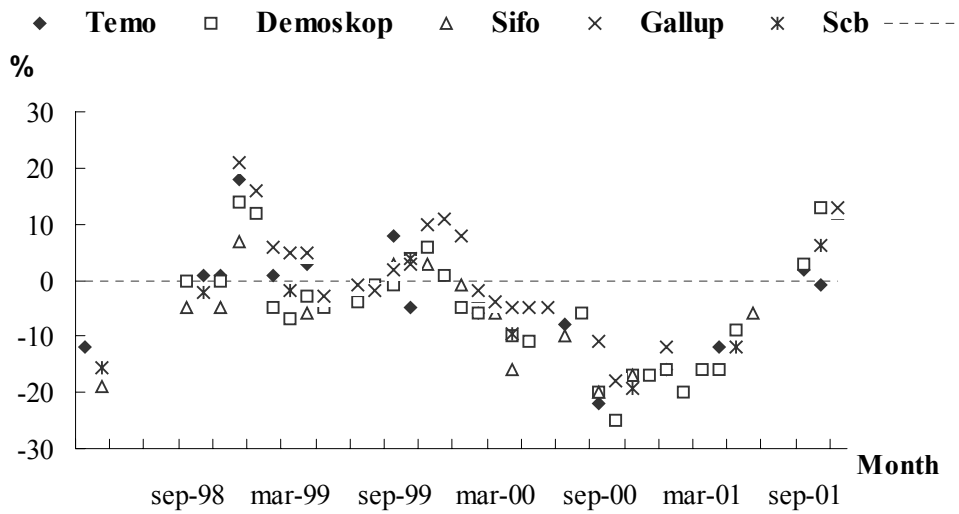


Figure 1. The difference between yes and no respondents in Swedish public opinion data on membership in the EMU, April 1998 to December 2001.