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THE CURRENT ACCOUNT, SUPPLY SHOCKS AND ACCOMMODATIVE FISCAL POLICY: Interpretations of Swedish post-war data

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The aim of the paper is to assess empirically the importance of different types of shocks in explaining the Swedish current account. We do this by first estimating an unrestricted vector autoregression system in these four variables: the real wage, the terms of trade, government consumption, and the current account. We then perform innovation accounting and impulse response studies based on a particular structural model with labour-union determined wages and government consumption taken to be accommodative in response to private sector labour demand.

A principal finding is that the forecast error variance in the current account is to a very limited extent (less than 20 per cent over a couple of years) explained by innovations to the wage, terms-of-trade, or government-consumption equations. This is in contrast with the »conventional wisdom» and also with the results for some of the other variables. For example, innovations in the terms-of-trade equation explain more than half of the variance of the wage.

1. Introduction

In policy discussions in small open economies the current account is frequently used as an important macroeconomic information variable or intermediary target. This practice is, explicitly or implicitly, based on certain opinions about what factors are important in explaining and forecasting the current account. It is, e.g., a widely held view that domestic wages and the terms of trade play important roles. Changes in national saving are also often seen as indicating that stabilization policy is overly expansive or contractive. In ex post interpretations of the current account development »wage shocks», »price shocks», and »policy shocks» are prominent »explanations». The primary aim of this pa-

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per is to assess the importance of these types of shocks for the Swedish current account development during the post-war period.

Recent theoretical work analyzing the current account in an intertemporal general equilibrium framework teaches that the directions of the effects of various macroeconomic disturbances are in general ambiguous and depend crucially on the exact nature of the model studied; see, e.g., Obstfeld (1982), Svensson and Razin (1983), and Persson and Svensson (1985) on the Harberger – Laursen – Metzler (terms of trade) effect; Svensson (1984) on the effects of oil price and labor supply changes under sticky and flexible wages; Sachs (1982) and Razin (1984) on the effects of changes in government spending, etc.

In trying to use these theoretical model structures as a basis for econometric studies of the current account one faces the well-known problem that factors taken to be sources of exogenous disturbances in the analytical model (terms of trade, wages, government expenditures, etc.) cannot plausibly be assumed to be strictly exogenous in the econometric model. The endogeneity of most rele-

Figure 1 a: Current account/price of imports.

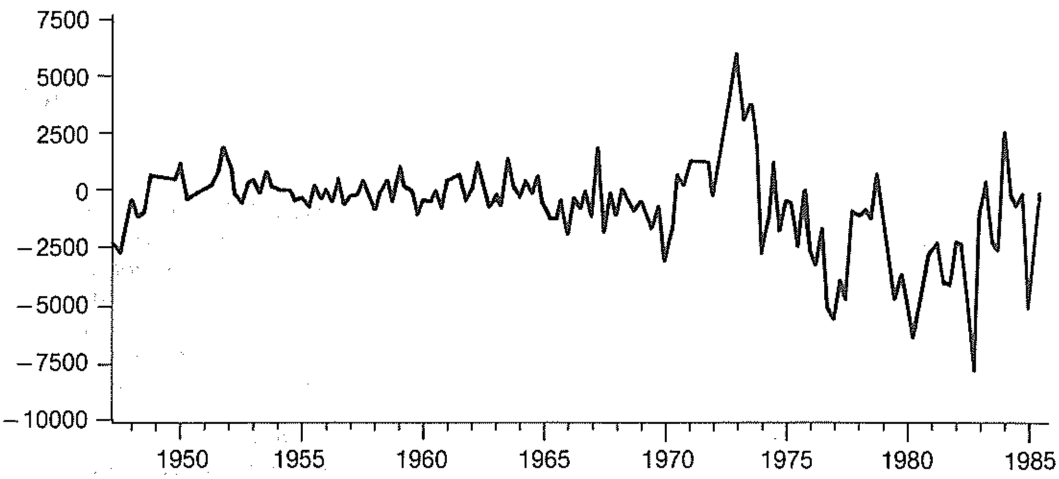


Figure 1 b: Log of real government consumption.

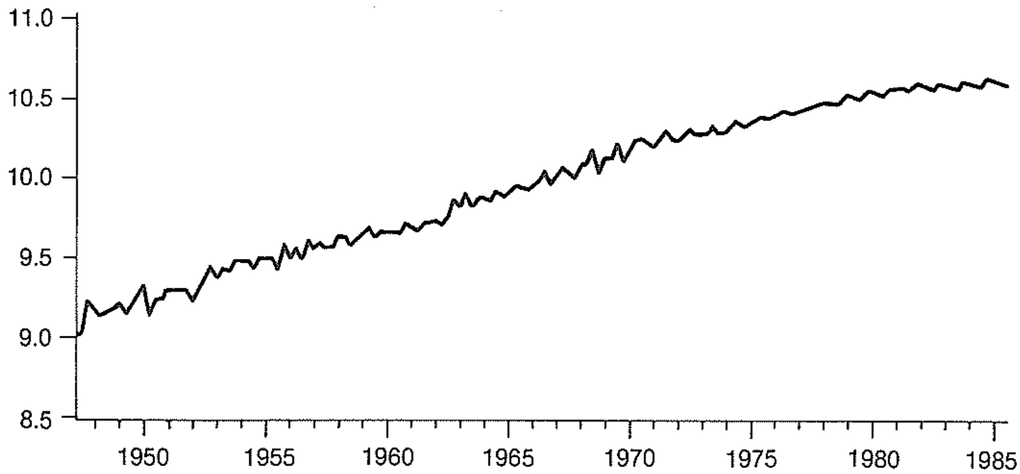


Figure 1 c: Log of terms of trade.

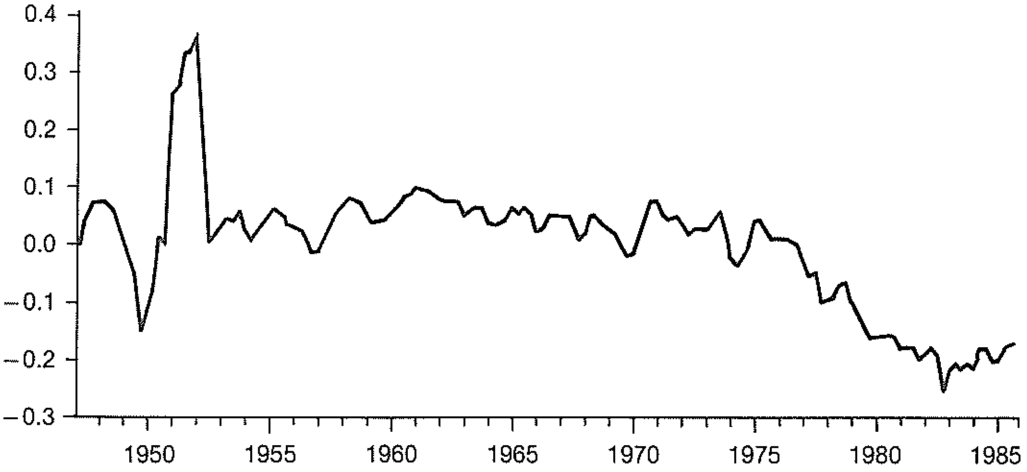
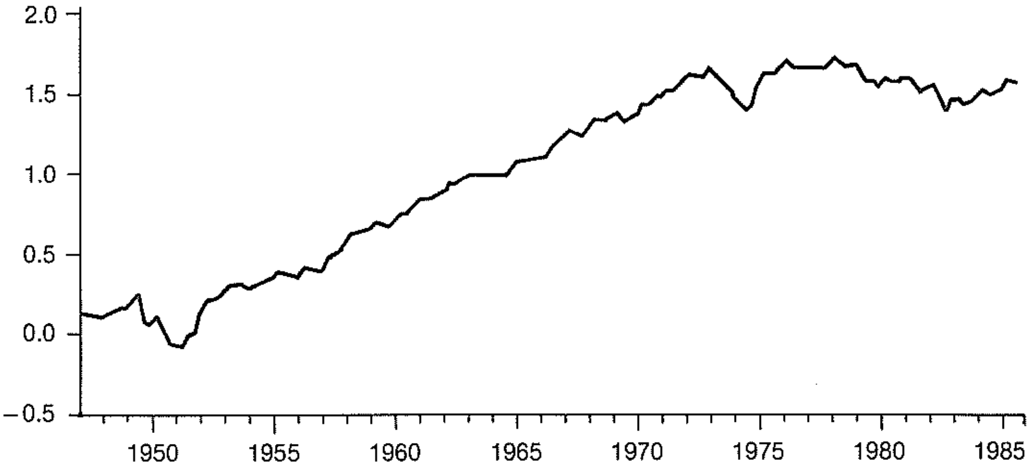


Figure 1 d: Log of real wage.



vant factors is well illustrated by a brief sketch of the Swedish post-war current account history (see e.g. Lindbeck (1975), Lundberg (1985) and Bosworth and Rivlin (1987) for more thorough treatments of Swedish stabilization policy). Some relevant data are plotted in Figures 1 a–d.[1]

[1] *Note that there are no genuine quarterly data on the current account and government consumption before 1970. See appendix A on our construction of these series.*

The external imbalances in the late 1940's and early 1950's have been viewed as consequences of the development of the nominal exchange rate, the terms of trade and real wages. For example, in 1949 the krona depreciated by ten per cent against the most important trading partners' currencies. This shock to the exchange rate was followed by a gradual decline of the real wage. The terms of trade fell temporarily, but improved (likewise temporarily) when raw materials prices rose during the Korea war boom.

The current account was approximately balanced over the decade 1954 – 1964, which is considered to be a period of successful stabilization policies. The stimulative and contractive measures undertaken in the following decade do not appear to have been equally well timed. It has been claimed that fiscal policy shocks account both for the current account deficits in the late 1960's and the surpluses in 1971 – 1973.

The first half of the 1970's may be characterized by the combination of large supply shocks and accommodative policies. When the world economy, following the first oil crisis, turned into a recession and the Swedish terms of trade deteriorated, policy was aimed at preserving a high level of employment. Government expenditures continued to increase rapidly, particularly in relation to the stagnating private sector development. This combination of international shocks and domestic policy is believed to be the main cause behind the extreme increase in nominal wages: more than 40 per cent during 1975 – 76. Real wages also rose rapidly, despite the downward trend in the terms of trade. These developments were accompanied by a current account deterioration much stronger than the OECD average; cf. Sachs (1981).

Lingering external balance problems in the late 70's are believed to reflect a lag in the adjustment of real wages and overall spending to the international stagnation. It is also believed that the accommodative design of macroeconomic policies hindered a more rapid adjustment. Devaluations were undertaken in 1976, 1977, 1981, and 1982. Real wages started to fall in 1978, but the current account remained in deficit until 1984.

Interpretations of economic history tend to view causation as going from policy and external shocks to the variable of interest, in our case the current account. Such interpretations are complicated by the fact that some shifts in supply curves and policy may not be autonomous. The deterioration of the current account and budget balances in the 1970's may, e.g., be explained by increases in government spending in the form of employment benefits or public employment that resulted from the terms of trade and wage shocks, as suggested by Söderström and Viotti (1979). But some economists have argued that there may be a reverse causation in that the frequency and size of wage disturbances depend on the government's choice whether to accommodate supply shocks or not (see, e.g., Calmfors and Horn (1986)). Further, the current account may serve as a target for government policy. This has, e.g., been suggested by Summers (1987) as an explanation of the Feldstein and Horioka (1980) finding that savings and investment rates tend to be highly correlated.[2]

In this paper we estimate a vector autoregression (VAR) model of the current account, the real wage, the terms of trade and government consumption. We use the estimated model to illuminate the role played by various shocks to the development of these variables. In interpreting the resulting impulse response functions we use a specific but fairly general exactly identified model. Our use of VAR analysis in this way follows recent work by Sims (1986), Blanchard and Watson (1986), and Bernanke (1986).

The theoretical and methodological framework is discussed in the next section, and the empirical results are presented and interpreted in section 3. A principal result is that the forecast error variance in the current account is to a very limited extent accounted for by shocks to the terms of trade, wage, or government consumption. We suggest that domestic and international demand and domestic productivity shocks may be the dominant sources of current account variations. Terms-of-trade shocks are found to have a positive impact on the current account, both in the short run and over a longer horizon. We also find, somewhat surprisingly, that a positive wage shock leads to a current account surplus. Another important finding is that terms of trade shocks have a strong and positive effect on the wage level; over a horizon longer than two years they account for more than half of the wage variance.

2. The econometric model

An unrestricted vector autoregression model can be seen as a reduced form from any of

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[2] *For a statement by Swedish policy makers about the importance attached to the current account see Heikensten and Åsbrink (1986). See also Söderström (1984) for a discussion of the relation between the current account and fiscal policy.*

a family of (linearized) structural models containing the variables included in the VAR system. Hence, the residual in a particular equation will be some combination of shocks to the underlying model. This means that in order to give a structural meaning to variance decompositions and impulse response functions we have to make assumptions that allow us to identify the shocks to the structural model.

In section 2.1 we outline a model of a small open economy, which is broadly in line with recent models aimed at analyzing policy options in small open economies with strong labor unions and a large public sector; see e.g. Persson and Svensson (1987). This model provides a framework for interpreting the results. Specifically, we use it to motivate our VAR system and the assumptions made that enable us to identify the structural shocks. Following a brief description of the VAR methodology in section 2.2 the identification problem is discussed in section 2.3.

2.1 A model of the current account

Almost all recent analytical studies of the determinants of the current account employ a deterministic framework[3]. Several authors, e.g. Persson and Svensson (1985), analyze the difference between fully anticipated and fully unanticipated disturbances in deterministic terms, but there are no stochastic models in the literature that are sufficiently rich to serve directly as a framework for econometric modelling. The model presentation in this section follows the standard practice of grafting a simple stochastic structure onto a deterministic model.

The following features of the model are worth emphasizing. First, it is a real model, where price levels and nominal exchange rates are absent. Second, wages are thought of as being set by labour unions without full information about contemporaneous market conditions. Third, government expenditure is taken to be endogenous, e.g. with the aim of accommodating tendencies to unemployment that may result from private sector behaviour. Fourth, exports may be large relative to world market demand, i.e. the terms of trade are not a priori assumed to be strictly exogenous.

The equations in the model are subjected to a vector of fundamental stochastic shocks, u_t, which are serially uncorrelated. The model contains both contemporaneous and lagged variables, but we will not be explicit about the exact role played by the lagged variables. They may represent the direct impact of past decisions due to transactions and adjustment costs as well as the informational content in past observations for making predictions about the future. We are also agnostic about what lagged variables enter into what equation and simply represent all lagged variables by an unspecified vector Ω_{t-1} which is the same in each equation. In contrast a careful specification of contemporaneous interactions is crucial in order to discuss how the various structural shocks may be identified from the estimated VAR system.

An important step in any vector autoregression is the choice of variables to include. In the present study we limit ourselves to four: the current account, the terms of trade, the real wage, and government consumption. At this stage one aspect of this choice merits mentioning. As the modern theory of current account determination is explicitly intertemporal it would be natural to include an interest rate among the variables. Our reason for not doing so is that regulations both in the domestic credit market and with regard to international capital flows have for most of the period under study been so prominent in Sweden as to make any interest series very hard to interpret. It is an important challenge for research, however, to construct a data series that adequately represents the rate of discount relevant to Swedish decision makers.

We may now outline the model. There are two goods. The production of home goods, Y, is used both for consumption, C^h, and investment, I, with the remainder being supplied to the world market. With market clearing world market prices exports, X, would equal $Y - C^h - I$. Foreign goods are used for consumption, C^f, and as intermediary inputs in production, M.

[3] *One exception is the work by Clarida (1986a, b) analyzing stochastic general equilibrium models of a world comprised of a continuum of small economies all subject to productivity shocks. Surpluses and deficits to the balance of payments result from the desire to smooth consumption relative to the income pattern.*

The focus of analysis is on the current account defined by

$$(1)\quad CA_t = p_tX_t - C^f_t - M_t + r_tF_t,$$

where F_t is net foreign assets, r_t is the interest rate, and p_t is the price of home goods in terms of foreign goods, i.e. the terms of trade. Foreign assets evolve according to

$$(2)\quad F_t = F_{t-1} + CA_{t-1}.$$

The representative *firm* produces home goods using capital, K, labour, L^h, and intermediary goods, M, as inputs:

$$(3)\quad Y_t = Y(K_t, L^h_t, M_t, u^y_t),$$

where u^y is a productivity shock. The firm maximizes its market value treating the price of home goods, p, and the wage level, w, as exogenously given. Both these prices are in terms of the world market price of foreign goods which serves as the numeraire. This gives rise to the factor demand equations

$$(4)\quad L^h_t = L^h(w_t, p_t, \Omega_{t-1}, u^l_t),$$

$$(5)\quad I_t = I(w_t, p_t, \Omega_{t-1}, u^i_t), \text{ and}$$

$$(6)\quad M_t = M(w_t, p_t, \Omega_{t-1}, u^m_t),$$

where the lagged variables Ω_{t-1} are relevant due to adjustment costs or in affecting expectations, and there are separate but possibly correlated shocks to each of the factor demand equations. The rate of discount should also enter these equations, but it is suppressed since it will not be a part of our VAR representation of the model. The development of the capital stock is given by

$$(7)\quad K_t = (1-\delta)K_{t-1} + I_{t-1},$$

where δ is the rate of depreciation.

The *public sector* produces government consumption goods according to the production function

$$(8)\quad G_t = G(L^g_t).$$

In deciding about employment in the public sector the government attempts to offset variations in private sector employment that result from union set wages. We write the government's decision rule as

$$(9)\quad L^g_t = L^g(L^h_t, u^g_t).$$

The fiscal policy shock u^g may be seen as representing the peculiarities of the political decision making process and the preference of the ruling party.

The representative *consumer* maximizes discounted expected lifetime utility, with instantaneous utility derived from the consumption of home goods, C^h, foreign goods, C^f, government goods, G, and working time. The working week is fixed and all consumers want to work. Assuming labour demand not to exceed potential supply working time is given by $L^h + L^g$. The representative consumer can then be viewed as maximizing utility over C^h and C^f restricted by his net wealth, defined as the discounted value of future production net of taxes minus foreign indebtedness, and by exogenously given values of G and $L^h + L^g$. This gives rise to demand functions

$$(10)\quad C^j_t = C^j(Y_t, p_t, G_t, L^h_t + L^g_t, \Omega_{t-1}, u^j_t)\quad j = h, f,$$

where the interest rate is again suppressed. Preferences are subjected to random shocks. Note that taxes are not present in (10) which may be interpreted as assuming »Ricardian equivalence». The validity of this assumption will be indirectly tested as we check the sensitivity of our regression results to the inclusion of the government budget balance in the VAR system.

Wages are set by the representative *labour union,* which maximizes the expected discounted utility of its representative member. Specifically, it maximizes a function of real wages and employment;

$$(11)\quad w_t = w(L^h_t + L^g_t, \Omega_{t-1}, u^w_t).$$

The wage shock u^w represents the particular preferences of the union leadership, e.g. the weight put on real wages in relation to employment.

We assume that import prices are exogenously determined, the reason for this being that the country is small relative to the market for foreign goods. On the other hand, we assume that the domestic production of the representative home good is large relative to the size of the world market for these goods, and so the volume of exports may have an impact on world market prices. This, of course, is not in conflict with the assumption made above that the representative domestic firm is a price taker in the world market. The world market demand curve for home goods may be written

(12) $X_t = X(p_t, \Omega_{t-1}, u_t^x)$,

where u^x is a shock to world market demand and the vector Ω represents relevant variables in the information sets of international agents. With market clearing (12) may be inverted to yield the *terms of trade* as a function of exports. We will instead take market prices to be pre-determined. More precisely it is assumed that prices are set without access to any contemporaneous information, in particular about current supply. This yields the terms of trade equation

(13) $p_t = p(\Omega_{t-1}, u_t^p)$,

where u_t^p is a shock to the price setters' behaviour. Note the difference in interpretation between the shocks to (12) and (13). With predetermined prices u^p is an autonomous shock to price setting which is unrelated to the contemporaneous demand shock.

When p is predetermined the home country may find itself rationed in the export market. Let us assume that the export volume is given by the minimum of demand and supply, i.e.

$$(14)\ X_t = \begin{cases} Y_t - C_t^h - I_t & \text{if } Y_t - C_t^h - I_t < X(p_t, \Omega_{t-1}, u_t^x) \\ X(p_t, \Omega_{t-1}, u_t^x) & \text{if } Y_t - C_t^h - I_t \geq X(p_t, \Omega_{t-1}, u_t^x) \end{cases}$$

where p_t is given by (13).[4]

Let us now rewrite the model in terms of the four endogenous variables: w, G, CA, and p. The wage may be expressed as a function of G and p by substituting (4) and (8) into (11). Similarly government consumption is given by substituting (9) and (4) into (8);

(15) $w_t = w(G_t, p_t, \Omega_{t-1}, u_t^l, u_t^w)$, and

(16) $G_t = G(w_t, p_t, \Omega_{t-1}, u_t^l, u_t^g)$.

Further, substitution from (2)–(10) and (14) into (1) yields

(17) $CA_t = CA(w_t, p_t, G_t, \Omega_{t-1}, u_t^y, u_t^l, u_t^i, u_t^m, u_t^h, u_t^f, u_t^x)$,

where u^x (u^i, u^h) only appears to the extent that domestic export supply does not fall short of (exceed) the demand for exports.

Finally, we have the terms-of-trade equation. With p predetermined it is simply given by (13).

Equations (13), (15), (16) and (17) form an interdependent system from which CA_t, p_t, G_t, and w_t can be solved as functions of the vector u_t and Ω_{t-1}. In order to understand what information we may gain about this system from a vector autoregression we will devote the next section to a brief methodological overview.

2.2 *Vector autoregression methods*

A vector autoregression model is a system of n equations

(18) $Z(t) = C(L)Z(t) + v(t)$,

where Z(t) is a variable vector, C(L) is a matrix of lag polynomials defined by

(19) $C(L)Z(t) \equiv \sum_s C_s\, Z(t-s), \quad s > 0$

and v(t) is a vector of white noise residuals. This system can be seen as a reduced form of a »structural» model

(20) $Z(t) = B_0Z(t) + B(L)Z(t) + Au(t)$,

where B_0 is a coefficient matrix of contemporaneous relations, B(L) a matrix of lag polynomials, u(t) a vector of structural disturbances, and A a coefficient matrix. Off-diagonal elements of A indicate that a structural disturbance affects more than one equation. The elements of u are assumed to be uncorrelated, i.e. $E(uu') = \Sigma$ is a diagonal matrix. The coefficients and residuals in the reduced form VAR model are related to the structural model by

(21) $C(L) = (I - B_0)^{-1}\, B(L)$

(22) $v(t) = B_0v(t) + Au(t)$.

Equation (22) is a purely contemporaneous

[4] *We assume that those goods that are not exported when $Y - C^h - I \geq X(p, \Omega, u^x)$ may be stored and supplied to the market in the next period. This gives an extra intertemporal link in that today's world market prices will affect tomorrow's decisions via their effects on the inventories carried over. This will not, however, introduce new arguments into any of the equations as defined above since lagged world market prices are contained in the vector Ω.*

structural model. Since there are $n(n+1)/2$ distinct elements in the variance covariance matrix vv' and Σ is diagonal, giving n variances to estimate, it is possible to identify a maximum of $n(n-1)/2$ distinct parameters of B_0 and A.

The estimated VAR model may be used to do innovation accounting and to calculate impulse response functions. To do this rewrite the VAR model into the moving average system

$$(23) \quad Z(t) = H(L)u(t), \text{ where}$$

$$(24) \quad H(L) = (I - C(L))^{-1} (I - B_0)^{-1} A.$$

The moving average representation (23) is sometimes called the *impulse response* function as it gives the impact on the vector Z in period t of a specific innovation in a certain earlier period. Based on this representation of the model one may also express the variance of the k period ahead forecast error of variable i as a function of the variances of the innovations,

$$(25) \quad E\{[Z_i(t+k) - E_t Z_i(t+k)]^2\} = \sum_{s=0}^{k-1} \sum_j H_s(ij)^2 \sigma_j,$$

where $H_s(ij)$ is an element of the coefficient matrix H(L) at lag length s and σ_j is the j–th diagonal element of Σ. Such a decomposition of the variance for the i–th variable into the contributions of innovations in the different structural equations j is called *innovation accounting*.

As should be clear from this discussion innovation accounting and impulse response calculations are done based on a particular orthogonalization of the errors to the VAR system. The identification is achieved through restrictions on the parameters of B_0 and A in the structural contemporaneous model (22).

2.3 *Identifying assumptions*

Our model of the current account summarized in equations (13), (15), (16), and (17) can be rewritten so that it corresponds to the structural model (20). We assume that the vector Ω_{t-1} consists only of lagged values of the endogenous variables in this model. Then the reduced form of the model is a system of vector autoregression equations corresponding to (18) stating CA_t, w_t, p_t, and G_t as functions of lagged values of these variables and contemporaneous shocks.

Even if all elements of the vector u are assumed uncorrelated the errors to the reduced form will be correlated. Uncorrelated error terms of the structural equations will be identified by assuming that the labour unions in setting the wage level only have access to information about current terms of trade, and that the government in deciding about public expenditure can observe both current terms of trade and wages, but not actual private employment, L^h.

These assumptions give us a recursive system with the ordering p – w – G – CA, i.e. the matrix corresponding to B_0 is lower triangular and its elements may be estimated by OLS regression of the residuals from a standard VAR estimation. With the elements of u being uncorrelated the matrix corresponding to A is an identity matrix, and it is possible to interpret each shock as pertaining to a particular equation of the structural model. The wage, terms of trade, and government consumption shocks correspond directly to u^w, u^p, and u^g, and the current account shock, which we denote by u^{ca}, is some combination of export demand, domestic productivity, factor demand and preference shocks.[5]

In the next section we report the results of a study where we first estimate an unrestricted vector autoregression corresponding to (18) and then use the identifying restrictions on B_0 and Σ made above for innovation accounting and impulse response calculations.

3. *Results*

Our four variable VAR system is estimated on quarterly observations from 1948: 2 to 1985: 3. The data series used are plotted in Figures 1a – d.

The original current account and government consumption series show marked seasonal patterns. Due to our construction of the quarterly data for the earlier years these pat-

[5] *Since the model is exactly identified it is not possible to test the identifying assumptions. What may be done is to investigate the sensitivity of the results, i.e. the impulse response functions and the variance decompositions, to alternative exactly identifying assumptions.*

terns were different before and after 1970. The terms of trade and the real wage on the other hand show no clear seasonalities. In our estimations we have thus used seasonally adjusted series of G and CA, where the seasonal components have been calculated from OLS regressions of each series on quarterly dummies and a set of powers of time. Different regressions were run for the two subperiods.[6] Quarterly dummy variables were included in the estimated VAR system to capture possible deficiencies in the method used for deseasonalization.

Before presenting the estimated model, we should comment on the problem of drawing inferences from vector autoregressions of nonstationary data. Table B1 in appendix B gives the results of testing whether the univariate time series are integrated of order one, i.e. whether their first differences are stationary. For each of the series contained in our model we find that first order integration cannot be rejected. This is well in accord with the results of similar tests by Nelson and Plosser (1982). We have not, however, tested for the presence of cointegration among these series, i.e. whether linear combinations of any of the series are stationary, but have chosen to estimate our model on the original data in levels despite their possible non-stationarity. In doing this we rely on results of Sims, Stock and Watson (1990) showing that the asymptotic distribution for the coefficient estimates of an unrestricted vector autoregression in levels is identical with that for a model where the cointegrating vector is known exactly a priori and this is imposed as a restriction on the estimation.

We have investigated the sensitivity of our results by running a regression on differenced data, which would be the appropriate thing to do if the series were first-order integrated but not cointegrated. The differences in results are mostly minor with one or two exceptions which will be commented on below.[7]

Table 1. Covariance matrix of residuals (Entries below the diagonal are correlations.)

	v^P	v^W	v^G	v^{CA}
v^P	.00092	.000032	.000003	10.883
v^W	.36	.00087	−.00008	10.999
v^G	.003	−.09	.00088	−2.007
v^{CA}	.26	.27	−.05	1.859.400

3.1 The estimated VAR Model

The estimated VAR system is presented in appendix B, Table B2. It includes four quarters of lagged variables. None of the equations show significant residual autocorrelation[8]. The covariance matrix of the residuals is displayed in Table 1. There is considerable correlation between the residuals of the wage, price and current account equations, whereas the residual associated with government consumption appears largely uncorrelated with the other residuals.

Chow tests indicate some parameter instability within the sample period. Dividing the sample in 1970 gives significant differences between the subperiods for the terms of trade and wage equations. Since the Korea inflation is often found to be hard to accommodate within the same model as the period thereafter we also estimated the model for 1954: 2 – 1985: 3. Again, Chow tests show signs of instability of the terms of trade and wage equations before and after 1970. While the main results remain unaltered between the periods we shall see that there are some interesting differences, e.g. with regard to the exogeneity of the terms of trade.

Even though the estimated system in itself is not of primary interest a few brief comments should be made. It is striking that the variables included contribute much less to explaining the variations of the current account than they do for the other variables; the

[6] *A description of the deseasonalization procedure is available from the authors upon request.*

[7] *If the series are known to be cointegrated, a VAR in first differences involves a misspecification, whereas a VAR in levels is only inefficient; cf. Engle and Granger (1987). The question whether an unrestricted VAR is inefficient compared to a model where estimated (as opposed to known) cointegrating vectors are imposed has no general answer. Engle and Yoo (1987) report a Monte Carlo forecasting experiment, comparing a vector autoregression in levels with the Engle and Granger (1987) two step method. They find that the former yields better forecasts over very short horizons but that the latter is superior after about four periods.*

[8] *When estimating on first differenced data there is significant autocorrelation in the current account equation.*

coefficient of determination is only .44 for this equation against over .9 for the other equations. Considering that the current account is the difference between two macroeconomic aggregates it may not be surprising that it is harder to predict than the other series. It is a bit surprising, though, that the explanatory power is so low, considering the fact that we have taken account of the variation in three variables which are usually thought of as the most important sources behind the fluctuations in the current account.[10]

In general we see that few variables other than lagged values of the dependent variable itself are significant. Table 2 gives the results of Granger causality tests, i.e. tests for the marginal predictive power of all lagged values of a variable in an equation. We can reject the hypotheses that the terms of trade are not Granger caused by government consumption and that the wage is not Granger caused by the terms of trade. Apart from these two cases, however, only lagged values of the dependent variables themselves have significant explanatory power. We cannot reject the hypotheses that government consumption and the current account are exogenous[11].

Some of the results with regard to Granger causality change when the system is estimated on differenced data (with the trend excluded). In this case we cannot reject that w is exogenous; it Granger causes p (marginal significance .001), whereas p does not seem to Granger cause w (marginal significance .09). G still Granger causes p, and it remains that one cannot reject exogeneity of CA and G (cf. Table B4). These results were also obtained when the system (in levels) was estimated using eight lags instead of four, except that in this case a significant influence from p on w was also found.[12]

Table 2. Tests of marginal predictive power of (4 lags of) row variables for column variables (Marginal significance levels).

	p	w	G	CA
p	.000	.000	.503	.969
w	.422	.000	.105	.887
G	.006	.196	.000	.293
CA	.636	.262	.768	.000

When only post-1954 or post-1970 data are used, the exogeneity of p cannot be rejected (cf. Tables B5 – 6). The exogeneity of G with respect to w is rejected for the period 1954: 2 – 1985: 3, but not for the periods 1949: 2 – 1969: 4 or 1970: 1 – 1985: 3. The result with regard to the current account is, however, very stable across different specifications and variable definitions.[13]

It may be tempting to interpret, e.g., the failure to reject the exogeneity of p in the post-1970 data set as an indication that Sweden is now a small open economy, or the lack of significant effects from the government budget balance on the current account as consistent with the »Ricardian equivalence» hypothesis. Without making further structural assumptions to account for the role of lagged variables we are not entitled to make such interpretations.

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[9] *For the subperiod 1946 – 69 it is not even possible to reject the hypothesis that the current account is white noise.*

[10] *Three potentially important variables which have not been incorporated in the VAR model are interest rates, the nominal exchange rate and the government budget deficit. The reason for excluding the interest rate has been discussed. We have chosen not to include any exchange rates, since changes in nominal exchange rates usually are believed to affect the current account through changes in real wages or terms of trade. Inclusion of the (seasonally adjusted) government budget deficit does not significantly improve the fit of the CA equation (cf Table B7). The government budget balance (GB in Table B7) is defined as the decrease in government debt. The series has been deflated and deseasonalized in the same way as CA.*

[11] *Granger non-causality is a necessary, but not sufficient, condition for exogeneity (cf. Cooley and LeRoy (1985)).*

[12] *For the VAR model as a whole, it is restrictive to limit the lag length to four quarters, at least according to the likelihood ratio test suggested by Sims (1980, p. 18). It is only in the terms of trade equation, however, that there is significant explanatory power attached to the group of variables with 5 – 8 lags (cf. Table B3).*

[13] *For instance, the exogeneity of CA cannot be rejected when w, G, and CA are normalized by division by industrial production (with no variables expressed in logarithms, and industrial production not seasonally adjusted). This normalization could, perhaps, be motivated as an attempt to transform the original data to stationary series. Neither does exclusion of the trend from the VAR model lead to rejection of the exogeneity of CA. These regressions are not reported.*

3.2 Responses to structural shocks

In interpreting our VAR system via impulse response functions and variance decompositions we will assume as discussed in section 2.3 that the contemporaneous part of the model is recursive in the order p – w – G – CA. This assumption allows us to identify the shocks to the structural model, i.e. the elements of the u vector. As we have seen from Table 1 that the stochastic disturbances of the reduced form VAR system — particularly v^p, v^w, and v^{ca} — are correlated, it is clear that our interpretations may be sensitive to this recursivity assumption. Modifying the recursive ordering to p – G – w – CA does not change any of the results markedly.

The contemporaneous correlations in Table 1 are reflected in the first steps of the impulse response functions plotted in Figures 2 a – *d*. We see that the effects of shocks in general are quite persistent; the 24-quarter response is in many cases about as large as that of the quarter next after the innovation. An exception to this is the current account equation, where the effects that persist after a couple of years are negligible relative to the response within a quarter. Another general feature is that the effects from shocks to the dependent variable itself are largest in absolute magnitude over the first year after the shock. Over a longer horizon the interdependence of the system is strong enough to make the response to impulses elsewhere in the model more important.

In Table 3 the innovation accounting results are presented. For three of the equations own innovations account for more than 70 per cent of the forecast error variance even over 24 quarters. The exception is the wage equation, where terms-of-trade innovations account for more than half of the variance over this horizon with wage innovations explaining a mere 20 per cent. In forecasting the current account, shocks to other equations account for less than 20 per cent of the variance.

It may be worth pointing out that the dominance of own effects even in the longer run

Figure 2 a: Effects of CA of innovations in p, w, G and CA.

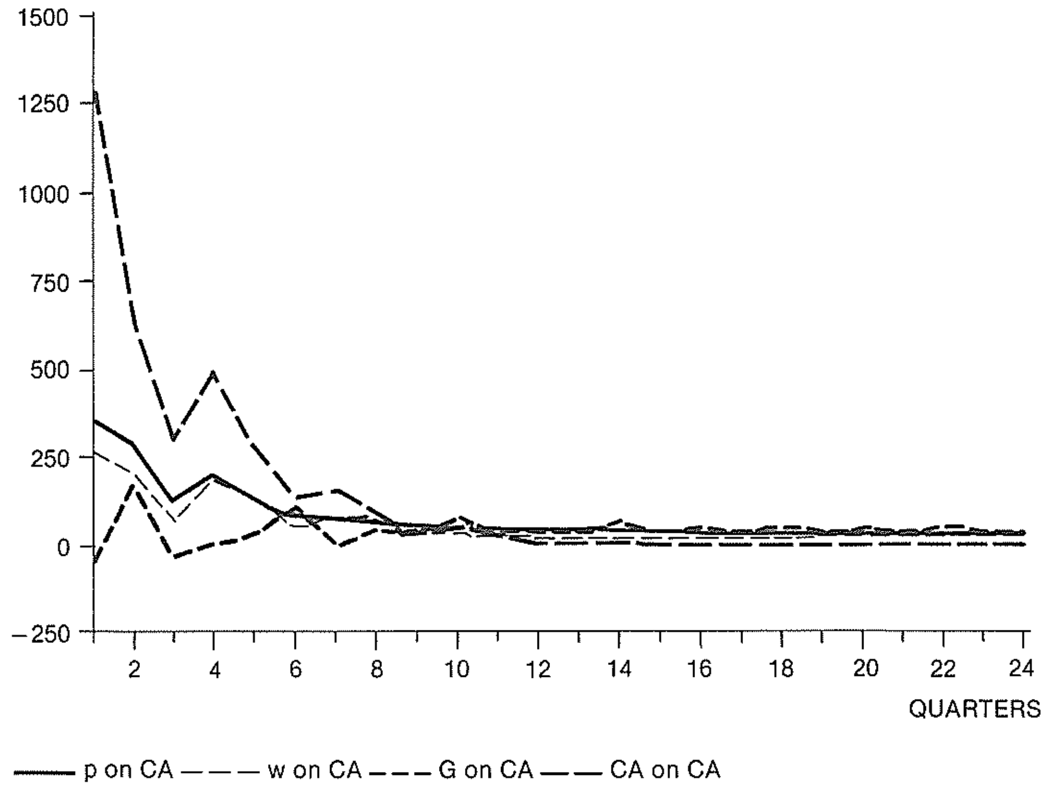


Figure 2 b: Effects on G of innovations in p, w, CA and G.

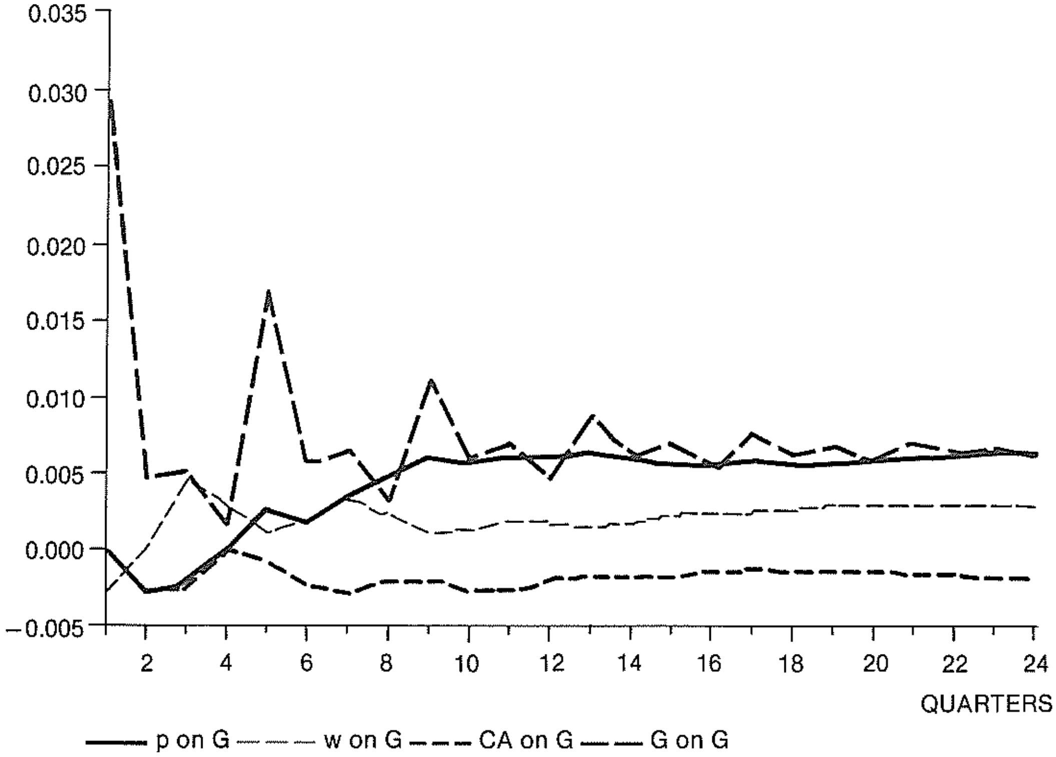


Figure 2 c: Effects on w of innovations in p, G, CA and w.

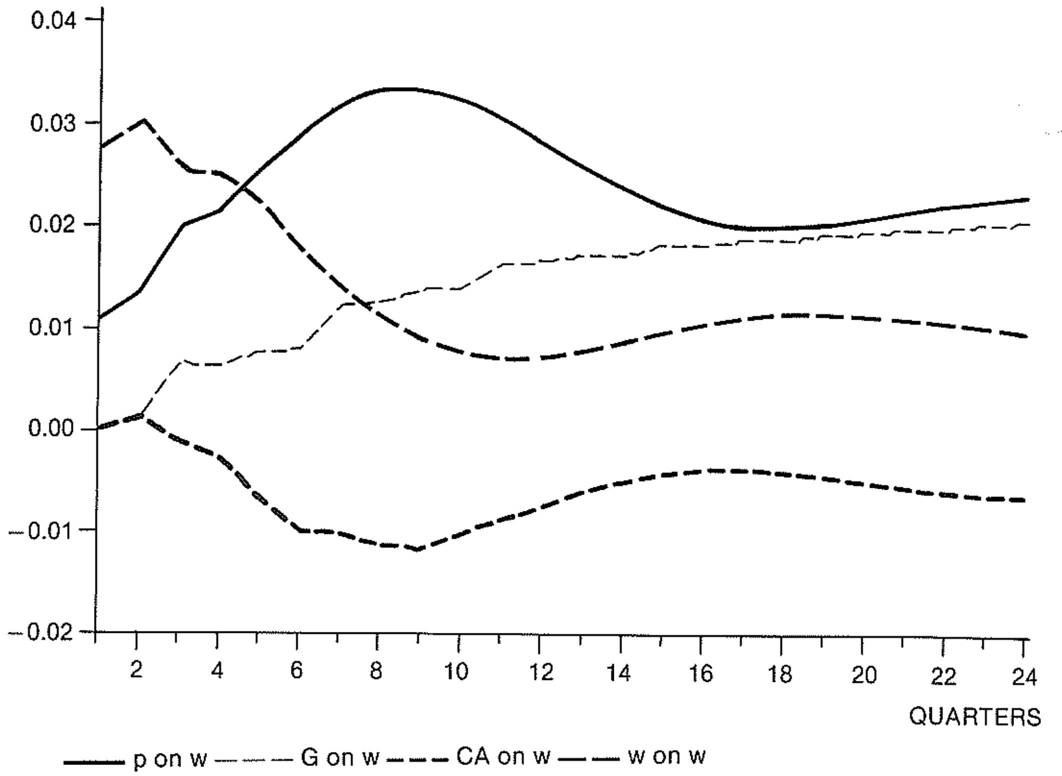
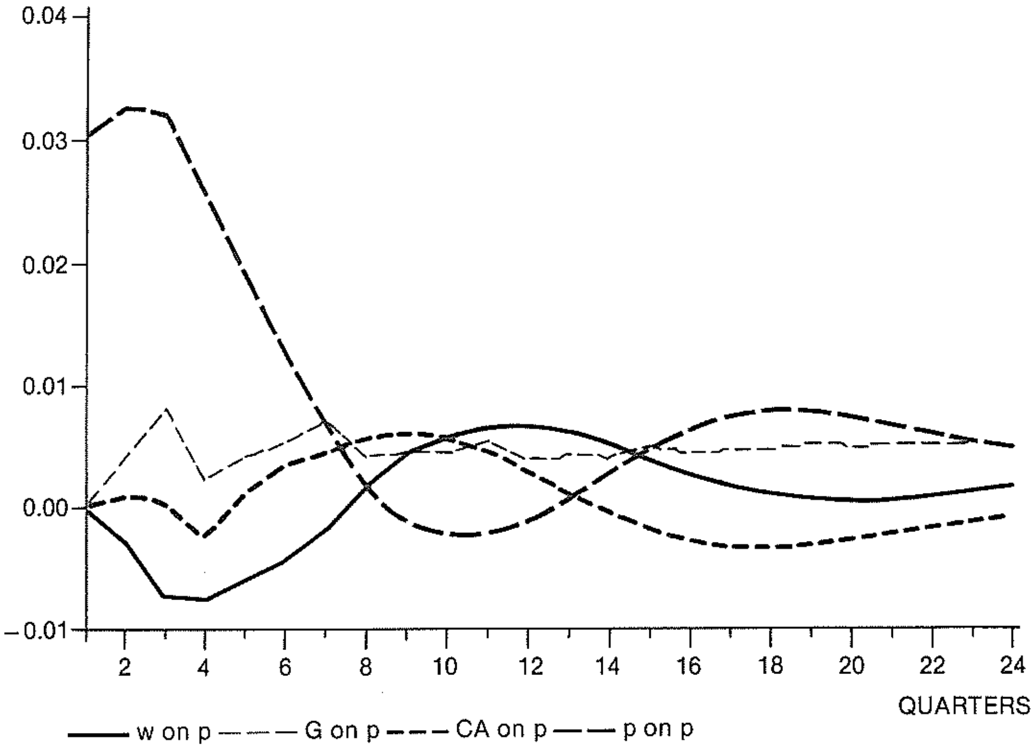


Figure 2 d: Effects on p of innovations in CA, w, G and p.



in terms of *innovation accounting,* is not in contrast with the fact that in the long run own effects are no larger than other effects in the *impulse response* graphs. The forecast error at t + k is the combination of long run impulse responses to innovations close to t and short run responses to innovations close to t + k. This means that short run impulse responses are important even for long run forecast errors. In particular this is so for equations, such as the CA equation, where the impulse responses are much larger in the short than in the long run.

Most of the innovation accounting results are stable across different specifications. Current account innovations regularly account for around 80 per cent of the forecast error variance of the current account itself, whereas the importance of such innovations are rather negligible in the other equations.[14] The main difference when limiting the study to the post 1970 period is that innovations in the current account gain importance to the forecast error variances of the other three variables; it now accounts for 20 per cent of the variance of w. The results with regard to the wage are more sensitive to model specification. The result in Table 3 that terms-of-trade innovations account for the major part of the uncertainty about the development of the real wage changes drastically when differenced data are used. In this case innovations to the real wage itself account for 86 per cent of the 24-quarter horizon forecast error variance.[15]

Let us now discuss the impulse response and innovation accounting patterns depicted in Figures 2a–d and Table 3 in more detail (bearing in mind that some of the impulse responses may not be significantly different from zero). A *shock to the current account*

[14] *Recall that the current account shock, u^{ca}, is a combination of various international and domestic demand and supply shocks. Hence, it may be somewhat misleading to label this shock »structural».*

[15] *It should also be mentioned that when the government budget balance is included in the model, it accounts for 25 per cent of the variance of p, and 51, 22, and 2 per cent of the variances, of w, G, and CA respectively.*

Table 3. Decomposition of variance.

a. Terms of trade

Innovation to	p	w	G	CA
Quarter				
4	94.5	3.0	2.2	0.2
8	90.4	3.8	4.2	1.5
12	84.6	6.4	5.6	3.3
16	81.9	7.8	6.8	3.4
24	79.4	7.2	9.5	3.9

b. The real wage

Innovation to	p	w	G	CA
Quarter				
4	27.5	70.2	2.0	0.2
8	49.2	41.7	5.2	3.9
12	57.3	28.3	9.4	5.0
16	57.1	24.3	14.2	4.4
24	54.0	20.6	21.4	4.0

c. Government consumption

Innovation to	p	w	G	CA
Quarter				
4	1.2	3.6	93.6	1.5
8	3.9	4.0	89.7	2.4
12	10.9	3.6	82.3	3.2
16	15.6	3.7	77.5	3.2
24	21.8	5.0	70.1	3.1

d. The current account

Innovation to	p	w	G	CA
Quarter				
4	9.5	5.2	1.1	84.2
8	10.0	5.8	1.5	82.8
12	10.2	5.8	1.7	82.3
16	10.3	5.8	1.9	82.0
24	10.5	5.8	2.2	81.5

Entries show percentage of forecast error variance of each variable at different horizons attributable to innovations in estimated equations associated with each variable.

equation has a strong short run impact on the current account. This effect vanishes rather quickly over around two years. The effects on the other equations are rather negligible. This pattern is consistent with the interpretation that the current account shock is mainly a temporary shock to domestic productivity and/or to world market demand. Such temporary shocks should have little impact on permanent income and hence on consumption. Consequently, savings should increase but investment would be unaltered. This implies a temporary improvement of the current account.

A *terms-of-trade shock* has an impact on the terms of trade which remains for a year and a half. It is the shock with the largest cross effects in all equations; it accounts for more than 10 per cent of the variance of CA, 20 per cent of the variance of G and 50 per cent of the variance of w. The effect on the current account is seen to be positive and quantitatively not negligible. It is known from the theoretical literature on the Harberger – Laursen – Metzler effect that the sign of this effect in general is indeterminate. Our result indicates that the so called direct effect not only dominates in the very short run but also over the longer run with more time for behavioural response and various substitution effects. The positive effects of u^p on w and G may come about because decision makers correctly perceive that a terms-of-trade shock increases wealth. The sign of the effect on G is not necessarily inconsistent with the hypothesis of accommodative fiscal policy (according to which a negative terms-of-trade shock would lead to an increase in government consumption); after five quarters the wage »overshoots» the terms of trade, and this is when the effect on G turns positive.

Wage shocks consistently have smaller effects than terms-of-trade shocks. Certainly they appear less important than commonly perceived in the Swedish debate. They are of limited importance even to the forecast error with regard to the wage level itself (except in the very short run). The effect on the current account is positive in both the short and the long run. One interpretation of this is that a wage shock has an immediate negative effect on consumption and thereby a positive effect on exports which is larger than the presumably negative effect on production. The impact of a wage shock on government consumption is positive (with the exception of the instantaneous effect in the first quarter), which is consistent with an accommodative fiscal policy.

Shocks to government consumption have long run effects on the current account which are comparable to those of terms of trade and wage shocks. Innovations to government consumption account for only 2 per cent of the forecast error variance for the current account, but for one fifth of the variance in the case of the real wage. Our finding of a negligible effect from innovations in government consumption on the current account may be contrasted with the study by Ahmed (1987) of government spending and the balance of trade in Britain between 1732 and 1913. Decomposing government spending into one permanent and one transitory part, he finds negative effects on the balance of trade from increases in both components, with transitory shocks exerting a larger influence. He also finds insignificant effects from adding the government budget deficit to the list of explanatory variables, which he interprets as consistent with the Ricardian equivalence hypothesis.

Our results with regard to the Granger noncausality of the current account are in line with those reached by Backus (1986) on the Canadian trade balance. These time series patterns are somewhat reminiscent of the random-walk hypothesis of consumption associated with the work of Hall (1978), since the current account is income minus consumption minus investment. Clarida (1986b) studies a dynamic equilibrium model, where the current account reflects consumption smoothing in response to random productivity shocks, the only shock present in the model. He finds, however, that the current account cannot be represented as a Markov process; the current account in t + 1 is a function not only of the current account in t but also of the productivity shock in t.

4. *Concluding comments*

The aim of the research presented in this paper is to contribute to the understanding of the role played by different factors in determining the current account. In particular we have aimed at distinguishing between domestic wage shocks, international terms of trade shocks, and policy shocks to government consumption.

Vector autoregression methods offer a way to study patterns in time series data with a limited amount of a priori restrictions from economic theory. Nevertheless such restrictions necessarily enter. It has been a main theme in the paper that the orthogonalization underlying the impulse response functions and the associated innovation accounting reflects structural assumptions about the contemporaneous relations between the variables. The recursive structure of the B_0 matrix assumed here presumes among other things that international prices may be taken to be predetermined at a quarterly basis.

There is one conclusion that stands out from this study: the variance of neither terms of trade shocks, nor wage shocks nor government consumption shocks explain more than a small fraction of the variance of the current account. This casts doubt on much of the debate in Sweden as well as in other countries on these issues. It suggests that other shocks are the dominant sources of current account variations.

To use our results for policy analysis is of course a treacherous exercise, in view of the weak restrictions that have been imposed on the estimated model. Let us, nevertheless, conclude with a few comments on their relevance for fiscal policy. The most important effect of shocks to government consumption is on the long run development of the real wage, even if their contribution is smaller than that of terms of trade shocks. The relative importance of fiscal policy is larger if shocks to the government budget balance are considered, but in neither case do policy shocks (or supply shocks) matter as far as the current account is concerned. It is often said that policy measures undertaken in order to improve the current account are successful only to the extent that they affect real wages and the relation between the prices of domestic and foreign products. Our study gives mixed results with regard to the small open economy hypothesis of exogenous terms of trade; whether it is rejected or not depends on the sample period under study, and the terms of trade equation shows signs of parameter instability. If p were exogenous with respect to the nominal exchange rate, it would make sense to view a devaluation as a negative real wage shock, which we have seen typically has a slight negative impact on the current account.

References

Ahmed, S. (1987), »Government Spending, the Balance of Trade and the Terms of Trade in British History», *Journal of Monetary Economics 20*, 195–220.

Backus, D. (1986), »The Canadian – U.S. Exchange Rate:

Evidence from a Vector Autoregression», *Review of Economics and Statistics 68,* 628–637.
Bernanke, B.S. (1986), »Alternative Explanations of the Money – Income Correlation», *Carnegie Rochester Conference Series on Public Policy, 25,* 49–100.
Blanchard, O.J. and Watson M. (1986), »Are Business Cycles All Alike?», in R Gordon (ed.), *The American Business Cycle: Continuity and Change,* NBER and University of Chicago Press.
Bosworth, B.P. and Rivlin, A.M. (eds.), (1987), *The Swedish Economy,* the Brookings Institution.
Calmfors, L. and Horn, H. (1986), »Employment Policies and Centralized Wage-setting», *Economica 53,* 281–302.
Clarida, R.H. (1986a), »International Lending and Borrowing in a Stochastic Sequence Equilibrium», NBER Working Paper No. 1944.
Clarida, R.H. (1986b), »The Balance of Payments Adjustment Mechanism in a Rational Expectations Equilibrium», NBER Working Paper No. 1945.
Cooley, T.F. and LeRoy, S.F. (1985), »Atheoretical Macroeconometrics. A Critique», *Journal of Monetary Economics 16,* 283–308.
Engle, R.F. and Granger, C.W.J. (1987), »Co-integration and Error Correction: Representation, Estimation, and Testing», *Econometrica 55,* 251–276.
Engle, R.F. and Yoo, B.S. (1987), »Forecasting and Testing in Co-Integrated Systems», *Journal of Econometrics 35,* 143–159.
Feldstein, M. and Horioka, C. (1980), »Domestic Savings and International Capital Flows», *Economic Journal 90,* 314–329.
Fuller, W.A. (1976), *Introduction to Statistical Time Series,* Wiley, New York.
Hall, R.E. (1978), »Stochastic Implications of the Life – Cycle Permanent Income Hypothesis: Theory and Evidence», *Journal of Political Economy 86,* 971–1007.
Heikensten, L. and Åsbrink, E. (1986), »Currency Flows in 1985 and Swedish Economic Policy», *Skandinaviska Enskilda Banken Quarterly Review* 1/1986, 21–28.
Lindbeck, A. (1975), *Swedish Economic Policy,* Macmillan.
Lundberg, E. (1985), »The Rise and Fall of the Swedish Model», *Journal of Economic Literature 23,* 1–36.
Nelson C.R. and Plosser, C.J. (1982), »Trends and Random Walks in Macroeconomic Time Series», *Journal of Monetary Economics 10,* 139–162.
Obstfeld, M. (1982), »Aggregate Spending and the Terms of Trade: Is There a Laursen – Metzler Effect?», *Quarterly Journal of Economics 97,* 251–270.
Persson, T. and Svensson, L.E.O. (1985), »Current Account Dynamics and the Terms of Trade: Harberger – Laursen – Metzler Two Generations Later», *Journal of Political Economy 93,* 43–65.
Persson, T. and Svensson, L.E.O. (1987), *New Methods in the Swedish Medium-Term Survey,* Supplement no. 3 to the 1987 Medium-Term Survey, Allmänna Förlaget.
Razin, A. (1984), »Capital Movements, Intersectoral Resource Shifts and the Trade Balance», *European Economic Review 26,* 135–152.
Sachs, J. (1981), »The Current Account and Macroeconomic Adjustment in the 1970's», *Brookings Papers on Economic Activity,* 202–268.
Sachs, J. (1982), »The Current Account in the Macroeconomic Adjustment Process», *Scandinavian Journal of Economics 84,* 147–159.
Sims, C.A. (1980), »Macroeconomics and Reality», *Econometrica 48,* 1–48.
Sims, C.A. (1986), »Are Forecasting Models Usable for Policy Analysis?», *Federal Reserve Bank of Minneapolis Quarterly Review 10* (Winter 1986), 2–16.
Sims, C.A., Stock, J.H. and Watson, M.W. (1990), »Inference in Linear Time Series Models with Some Unit Roots», *Econometrica 58,* 113–144.
Summers, L.H. (1987), »Tax Policy and International Competitiveness», in J. Frenkel (ed.), *International Aspects of Fiscal Policies,* University of Chicago Press.
Svensson, L.E.O. (1984), »Oil Prices, Welfare, and the Trade Balance», *Quarterly Journal of Economics 99,* 649–672.
Svensson, L.E.O. and Razin, A. (1983), »The Terms of Trade and the Current Account: The Harberger – Laursen – Metzler Effect», *Journal of Political Economy 91,* 97–125.
Söderström, H.T. (1984), »Imbalances in the Swedish Economy from a Financial Perspective», *Skandinaviska Enskilda Banken Quarterly Review* 2/1984, 44–54.
Söderström, H.T. and Viotti, S. (1979), »Money Wage Disturbances and the Endogeneity of the Public Sector in an Open Economy», in A Lindbeck (ed.), *Inflation and Employment in Open Economics,* North-Holland.

Appendix A

The data series described in Figures 1a–d are defined as follows. The *terms of trade* are defined as the ratio between the export and import price indices (for total exports and imports of commodities). The *real wage* is the index for labor costs in the industrial sector, divided by the import price index. Wage and price indices refer to the middle month of each quarter. The terms of trade, wage and import price series have been normalized to be around 1.0 in 1947. In the regression analyses (as well as in Figures 1a–b) logarithms of terms of trade and real wages have bee used. The *current account* figures are the current account balance in current prices, divided by the import price index. Before 1970, no quarterly data on the current account are available. For these years we use the quarterly commodity trade balance figures instead. To these were added 25 % of the annual service account balance (incl. net interest payments and other transfers from the rest of the world). The *government consumption* figures are the deflated data given by the national accounts (with 1980 as the base year). Again, no quarterly figures exist before 1970. The annual figures for earlier years were therefore split on quarters according to the pattern of central government outlays. The government consumption data in Figure 1c (which have also been used in the regressions) are expressed in logarithms.

The *government budget balance* (GB), referred to in Section 3.1 and Table B7, is defined as the decrease in government debt. The series has been seasonally adjusted in the same way as G and CA. The industrial production series mentioned in note 13 is simply the industrial production index.

Most of the data have been obtained from Statistics Sweden (the Central Bureau of Statistics). Monthly data on export and import prices, wages, industrial production, commodity trade, government debt, and central government outlays, are published in the Monthly Digest of Swedish Statistics (»Allmän månadsstatistik»; »Kommersiella meddelanden» until the middle of the 1960's). The government consumption data are taken from the national accounts (e.g. »BNP kvartal 1985: 3»). The current account data (1970–1985) have been obtained from the Central Bank of Sweden.

Appendix B

Table B1. Tests for autoregressive unit roots.

$$z_t = \bar{\mu} + \hat{\lambda}t + \hat{\rho}_1 z_{t-1} + \sum_{i=2}^{k} \hat{\rho}_i (z_{t-i+1} - z_{t-i}) + \hat{u}_t$$

Series	T	k	$\hat{\mu}$	$t(\hat{\mu})$	$\hat{\gamma}$	$t(\hat{\gamma})$	$\hat{\rho}_1$	$\tau(\hat{\rho}_1)$	$s(\hat{u})$	DW
Terms of trade	145	8	0.023	2.45	−0.0003	−2.75	0.88	−2.59	0.032	2.06
Real wages	145	8	0.014	1.63	0.00005	0.20	0.99	−0.55	0.036	1.97
Government consumption	145	8	0.0002	0.00	−0.0002	−0.29	1.00	0.07	0.032	2.02
Current account	145	8	287.4	0.99	−5.10	−1.49	0.76	−2.40	1393.0	1.98

$t(\hat{\mu})$ and $t(\hat{\gamma})$ are the ratios of the OLS estimates of μ and γ to their respective standard errors. $\tau(\hat{\rho}_1)$ is the ratio of $\hat{\rho}_1 - 1$ to its standard error. The critical value of this statistic is 3.45 for a sample size of 100; see Fuller (1976). $S(\hat{u})$ is the standard error of the regression and DW is the conventional Durbin–Watson statistic.

Table B2. Terms of trade, real wages, government consumption, and the current account: VAR representation.

Regressors	Dependent variable (standard errors in parentheses) p_t		w_t		G_t		CA_t	
p_{t-1}	1.09	(0.09)	0.04	(0.09)	−0.09	(0.09)	2559	(4155)
p_{t-2}	−0.04	(0.13)	0.23	(0.13)	−0.003	(0.13)	−2272	(6011)
p_{t-3}	−0.20	(0.13)	−0.22	(0.13)	0.08	(0.13)	−678	(5993)
p_{t-4}	−0.03	(0.08)	0.18	(0.09)	0.02	(0.09)	144	(4000)
w_{t-1}	−0.09	(0.10)	1.09	(0.09)	0.04	(0.09)	3245	(4306)
w_{t-2}	−0.06	(0.14)	−0.25	(0.14)	0.14	(0.14)	−4922	(6514)
w_{t-3}	0.13	(0.14)	0.20	(0.14)	−0.14	(0.14)	4793	(6498)
w_{t-4}	0.01	(0.09)	−0.13	(0.09)	0.02	(0.09)	−2847	(4245)
G_{t-1}	0.14	(0.08)	0.04	(0.08)	0.14	(0.08)	6390	(3560)
G_{t-2}	0.09	(0.08)	0.16	(0.08)	0.17	(0.08)	−5665	(3504)
G_{t-3}	−0.22	(0.08)	−0.08	(0.08)	0.01	(0.08)	−129	(3536)
G_{t-4}	0.14	(0.07)	0.02	(0.07)	0.48	(0.07)	442	(3357)
CA_{t-1}	0.0000007	(0.0000021)	0.0000009	(0.0000020)	−0.0000022	(0.0000020)	0.49	(0.09)
CA_{t-2}	−0.0000005	(0.0000022)	−0.0000022	(0.0000021)	0.0000006	(0.0000022)	0.002	(0.10)
CA_{t-3}	−0.0000015	(0.0000023)	0.0000001	(0.0000022)	0.0000013	(0.0000022)	0.28	(0.10)
CA_{t-4}	0.0000031	(0.0000021)	−0.0000028	(0.0000021)	0.0000002	(0.0000021)	−0.12	(0.10)
C	−1.36	(0.92)	−1.22	(0.90)	1.79	(0.90)	−9257	(41461)
T	−0.0019	(0.0009)	−0.0002	(0.0008)	0.001	(0.0008)	−20.8	(394)
Q2	−0.006	(0.009)	0.01	(0.008)	−0.002	(0.008)	122	(394)
Q3	0.001	(0.009)	−0.03	(0.009)	−0.005	(0.009)	124	(399)
Q4	−0.009	(0.009)	−0.02	(0.0008)	−0.005	(0.009)	128	(395)
Stand. err.	0.033		0.032		0.032		1470.4	
$\bar{R}^2$	0.911		0.997		0.995		0.437	
Q	26.103		16.923		29.062		44.306	
(Significance)	(0.888)		(0.997)		(0.787)		(0.161)	

The definitions of p, w, G, and CA are given in the text. C is a constant, T is a linear trend, and Q2−4 are dummy variables for quarters II−IV. Q is the Box-Pierce statistic for autocorrelation, and the marginal significance level of the test is based on the chi-square distribution (36 d.o.f.).

Table B3. Tests of marginal predictive power of (8 lags of) row variables for column variables.

	p	w	G	CA
p	.000	.000	.107	.995
w	.014	.000	.605	.930
G	.004	.088	.000	.928
CA	.161	.532	.482	.000
$\bar{R}^2$	.935	.997	.995	.440
Q	19.274	11.095	30.967	27.052
(Significance)	.990	.999	.707	.859
Marg. sign. of lags 5−8	.000	.148	.147	.378

Table B4. Tests of marginal predictive power of (4 lags of) row variables for column variables.

	$p-p_{-1}$	$w-w_{-1}$	$G-G_{-1}$	$CA-CA_{-1}$
$p-p_{-1}$	.082	.087	.147	.980
$w-w_{-1}$	.001	.010	.077	.894
$G-G_{-1}$	.004	.126	.000	.312
$CA-CA_{-1}$	.658	.839	.766	.000
$\bar{R}^2$	.198	.225	.516	.117
Q	34.450	17.334	24.488	53.434
(Significance)	.542	.996	.927	.031

Table B5. Tests of marginal predictive power of (4 lags of) row variables for column variables.

a. Estimation period 1949: 2 – 1969: 4

	p	w	G	CA
p	.000	.019	.663	.638
w	.003	.000	.676	.873
G	.033	.636	.050	.695
CA	.025	.057	.899	.239
$\overline{R}^2$	.824	.996	.981	.026
Q	18.907	18.599	12.936	10.266
(Significance)	.873	.884	.990	.998

b. Estimation period 1970: 1 – 1985: 3

	p	w	G	CA
p	.000	.049	.292	.518
w	.440	.000	.292	.824
G	.297	.840	.000	.407
CA	.782	.592	.201	.001
$\overline{R}^2$	.964	.872	.985	.438
Q	28.144	10.136	17.848	20.276
(Significance)	.136	.977	.659	.504

Table B6. Tests of marginal predictive power of (4 lags of) row variables for column variables.

Estimation period 1954: 2 – 1985: 3

	p	w	G	CA
p	.000	.104	.147	.431
w	.781	.000	.014	.670
G	.693	.557	.000	.356
CA	.705	.441	.716	.000
$\overline{R}^2$	.967	.996	.995	.443
Q	29.403	21.580	42.320	41.727
(Significance)	.647	.936	.128	.142

Table B7. Tests of marginal predictive power of (4 lags of) row variables for column variables.

	p	w	G	GB	CA
p	.000	.038	.386	.928	.909
w	.005	.000	.306	.199	.856
G	.001	.174	.000	.652	.233
GB	.000	.007	.464	.000	.897
CA	.737	.071	.828	.047	.000
$\overline{R}^2$	.925	.997	.995	.832	.424
Q	34.456	19.861	28.615	33.711	43.899
(Significance)	.542	.986	.804	.578	.172