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Consumption smoothing and the current account: evidence for France, 1970–1996

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Abstract

This paper estimates a simple consumption-smoothing model of the French current account, and examines its capacity to predict recent developments in France's external performance. The model views the current account as a buffer through which private agents can smooth consumption over time in response to temporary disturbances to output, investment, and government expenditure. The empirical results indicate that the model performs well overall, and predicts correctly the sharp turnaround in France's external accounts observed in the past 3 years — a feature of the data that conventional models of trade flows, based on income and relative price variables, appear unable to explain.

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1. Introduction

France's external accounts improved markedly in 1992, and continued to improve between 1993 and 1996. After recording a deficit of 0.4% of GDP in 1991,

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the trade balance recorded a surplus equivalent to 0.4% in 1992, 1.2% in 1993 and 1.4% over the period 1994–1996. At the same time, the current account balance recorded a surplus of 0.3% of GDP in 1992, 0.9% in 1993–1994 and 1% in 1995–1996. However, conventional models of trade flows based on income and relative price variables appear to be unable to account for these developments. Movements in competitiveness recorded since the late 1980s and the 1992–1993 recession apparently explain only a small fraction of the improvement in France's external accounts in recent years.[1]

This paper attempts to interpret France's recent external performance on the basis of the consumption-smoothing (or intertemporal) approach to the current account. This approach, which has gained in popularity in recent years, focuses on the impact of current and future values of households' expected income on saving and investment.[2] The consumption-smoothing model has also featured prominently in the debate launched by Feldstein and Horioka (1980) on the degree of capital mobility across countries. As observed by Ghosh (1995), a formal comparison of the variance of the current account derived from the intertemporal model with the variance of the actual current account provides a natural procedure for assessing the extent to which a country may borrow freely (subject to a no-Ponzi game condition) at world interest rates.

In the present paper, a simple intertemporal model of the current account is estimated and used as a benchmark for assessing the behavior of France's external accounts. Section 2 presents the model. Section 3 provides estimates of the model parameters. Estimation results indicate that the model tracks remarkably well the historical data over the period 1970–1996 — despite the fact that France experienced large external shocks during the 1970s and that the period prior to the mid-1980s was characterized by capital controls. The existence of such controls could have been expected to distort lending and borrowing operations of French residents, and thus prevent them from effectively smoothing consumption spending over time. A comparison of the actual and simulated paths indicates that the model also accounts for the current account surpluses registered between 1992 and 1996. This result suggests that the surpluses may have reflected a downward revision in households' long-run expected resources, rather than a significant improvement in external price competitiveness.

2. The model

The intertemporal approach to the current account is derived from the permanent-income theory of consumption and saving. In the context of a small open economy with access to world capital markets, the permanent-income theory

[1]Developments in competitiveness of the French manufacturing industry since the early 1980s are reviewed by Agénor (1997). A 'conventional' model of trade flows (based on an error-correction framework) is estimated by Agénor and Bismut (1995).

[2]See Obstfeld and Rogoff (1994, 1996) and Razin (1995) for recent surveys of the literature.

implies that temporary shocks (which by definition have larger effects on current resources than lifetime resources) may lead to large fluctuations in national saving and the current account.

The model tested in this paper is based on a simple one-good framework, which can be described as follows.[3] Suppose that the only traded asset is a consumption-indexed bond with a fixed face value that pays net interest at the rate ρ between two periods. The representative consumer's preferences are separable intertemporally. The expected value of the discounted utility flow of the consumer is given by

$$E_0 \sum_{t=0}^{\infty} \alpha^t u(c_t), \quad 0 < \alpha < 1 \tag{1}$$

where α is a discount factor, c_t consumption, E_0 the expectations operator (conditional on information available at $t = 0$), $u()$ the instantaneous utility function, which possesses all familiar properties (namely, $u' > 0$ and $u'' < 0$). The consumer's budget constraint is

$$\Delta b_{t+1} = \rho b_t + y_t - I_t - c_t - \tau_t, \tag{2}$$

where b_t denotes holdings of indexed bonds (which are freely traded across countries) at the beginning of period t, ρ the world interest rate (assumed fixed), y_t output, I_t investment, τ_t lump-sum taxes, and Δ the first-difference operator. The government maintains a balanced budget, so that

$$g_t = \tau_t, \tag{3}$$

where g_t denotes government spending. Substituting Eq. (3) in Eq. (2) yields

$$b_{t+1} = (1 + \rho)b_t + y_t - I_t - c_t - g_t. \tag{4}$$

The representative consumer maximizes Eq. (1) subject to Eq. (4). As for instance in Otto (1992) and Sheffrin and Woo (1990), Fisherian separability is assumed to hold so that the levels of output and investment are treated as exogenous in solving for the optimal consumption path. Approximating the instantaneous utility function by the quadratic function $u(c_t) = c_t - c_t^2/2$ (which requires that $c_t < 1$ for the marginal utility of consumption to remain positive) and imposing the standard no-Ponzi game restriction yields:[4]

$$c_t^* = \frac{\rho}{\theta(1 + \rho)} E_t \left\{ \sum_{h=0}^{\infty} (1 + \rho)^{-h} z_{t+h} \right\} + (\rho/\theta) b_t, \tag{5}$$

[3] This basic framework has been used by a number of authors, including Milbourne and Otto (1992), Otto (1992), Sheffrin and Woo (1990), Ghosh (1995), and Cashin and McDermott (1998).

[4] The quadratic approximation is such that $u'''() = 0$, and implies that the optimal path of consumption does not depend on uncertainty over future consumption or the degree of variability of income.

where $\theta \equiv \alpha\rho(1+\rho)/[\alpha(1+\rho)^2-1]$, and $z_t = y_t - I_t - g_t$ is output net of private investment and public spending, and is often referred to as net output (Sheffrin and Woo, 1990), net private non-interest cash flow (Obstfeld and Rogoff, 1994), or simply national cash flow (Ghosh, 1995). The parameter θ reflects the consumption tilting dynamics of consumption, which results from divergences between the world interest rate and the domestic rate of time preference $(1-\alpha)/\alpha$. When $\theta > 1$ (or $\theta < 1$), agents tilt consumption towards the future (the present), whereas if $\theta = 1$ there is no tilting effect (see Sachs, 1982). In general, the higher the elasticity of intertemporal substitution, the stronger will be the tilting effect (Obstfeld and Rogoff, 1994). Thus, along the optimal path, private consumption depends on the present value of the expected future stream of cash flow, as well as the economy's existing stock of net foreign assets. Equivalently, Eq. (5) shows that private optimal consumption is proportional to wealth, defined as the present discounted value of the cash flow plus interest payments on the existing stock of assets. As pointed out by Milbourne and Otto (1992, p. 372), g_t in Eq. (5) could be interpreted as the present-value tax cost, using a Ricardian-equivalence argument.

By definition, the current account is equal to gross national product q_t (GDP plus interest income on the outstanding stock of foreign assets, $y_t + \rho b_t$) minus private and public expenditure $(c_t + I_t + g_t)$. The consumption-smoothing component of the current account, CA_t^*, can be defined as:[5]

$$\mathrm{CA}_t^* = (q_t - I_t - g_t) - \theta c_t^*. \tag{6}$$

Noting that the current account is also equal to net foreign asset accumulation $(b_{t+1} - b_t)$, simple manipulations using Eqs. (5) and (6) yield

$$\mathrm{CA}_t^* = -E_t\left\{\sum_{h=1}^{\infty}(1+\rho)^{-h}\Delta z_{t+h}\right\}, \tag{7}$$

which shows that the consumption-smoothing component of the current account is equal to minus the present discounted value of expected changes in the national cash flow variable. Eq. (7) indicates that permanent shocks, which have no effect on expected changes in the cash flow variable, leave the current account unaffected — as their expected change is zero. A permanent increase in y_t, for instance, induces a one-for-one increase in consumption and no change in the current account.[6] Unfavorable temporary cash flow shocks — such as an unexpected increase in government expenditure or investment — cause the expression on the right-hand side of Eq. (7) to fall, that is, the current account to move into a smaller surplus or greater deficit, and conversely in the case of favorable shocks. Thus, the

[5]Removing the consumption-tilting component of the current account (which is non-stationary) is necessary to ensure validity of standard inference techniques, as discussed below.

[6]However, permanent shocks to investment, to the extent that they raise future output, will lead to a deterioration of the current account (see Obstfeld and Rogoff, 1994).

current account acts as a buffer to smooth consumption in the presence of temporary disturbances.[7]

The main problem with implementing Eq. (7) empirically is the measurement of the expected changes in the cash flow variable. In line with most of the existing literature, here we will assume that the current account itself reflects all information about the future course of the cash flow variable.[8] In other words, national saving (net of investment) should help predict subsequent movements in the national cash flow variable.

We begin therefore by estimating a first-order unrestricted bivariate vector autoregressive (VAR) model in the cash flow variable and the actual consumption-smoothing component of the current account, defined as $\mathrm{CA}_t = (q_t - I_t - g_t) - \tilde{\theta} c_t$:

$$\begin{bmatrix} \Delta z_t \\ \mathrm{CA}_t \end{bmatrix} = \begin{bmatrix} a_1 & a_2 \\ a_3 & a_4 \end{bmatrix} \begin{bmatrix} \Delta z_{t-1} \\ \mathrm{CA}_{t-1} \end{bmatrix} + \begin{bmatrix} \epsilon_{1t} \\ \epsilon_{2t} \end{bmatrix}, \tag{8}$$

where ϵ_{1t} and ϵ_{2t} are disturbance terms and $\tilde{\theta}$ an estimated value of θ (see below). We then make use of the implication that

$$E_t \begin{bmatrix} \Delta z_{t+h} \\ \mathrm{CA}_{t+h} \end{bmatrix} = \begin{bmatrix} a_1 & a_2 \\ a_3 & a_4 \end{bmatrix}^h \begin{bmatrix} \Delta z_t \\ \mathrm{CA}_t \end{bmatrix} = A^h \begin{bmatrix} \Delta z_t \\ \mathrm{CA}_t \end{bmatrix}, \tag{9}$$

which can be substituted in Eq. (7) to give the estimator of the optimal current account:

$$\mathrm{CA}_t^* = -[1\ 0]\left[(1+\rho)^{-1} A\right]\left[I - (1+\rho)^{-1} A\right]^{-1} \begin{bmatrix} \Delta z_t \\ \mathrm{CA}_t \end{bmatrix}, \tag{10}$$

where I is the identity matrix. Expression (9) is valid as long as the infinite sum in Eq. (7) converges. This requires that the variables appearing in the VAR system (8) be stationary. Assuming that z_t is $I(1)$, Δz_t will be $I(0)$. And since under the null the actual consumption-smoothing current account (which is then equal to CA_t^*) is a discounted sum of Δz_t, it will also be $I(0)$.[9]

The estimate for the optimal current account derived from Eq. (10) can then be compared to the actual current account to determine, for instance, the extent to

[7] Eq. (7) also implies that a country will experience a persistent current account imbalance if the expected change in national cash flow has a non-zero mean. Suppose, for instance, that agents expect national cash flow to fall over time by an average of FF. 10 million. The steady-state current account surplus would be given by FF. $(10/\rho)$ million — or, assuming a world interest rate equal to 4%, a surplus of approximately FF. 250 million.

[8] See for instance Ghosh (1995) and Sheffrin and Woo (1990). This approach rests on the idea of Campbell and Shiller (1987), according to which an asset price reflects all the available information that is useful in predicting future earnings.

[9] Trehan and Walsh (1991) examine the conditions under which the assumption of stationarity of the current account is necessary for intertemporal budget balance.

which the surplus recorded in the past 3 years in France can be explained by consumption smoothing behavior. A variety of additional tests are also reported below.

3. Estimation results

The data used in our empirical investigation are seasonally-adjusted quarterly series on national accounts for the period 1970:1 to 1996:4.[10] y_t is real GDP, q_t real gross national product, I_t real gross private and public investment (defined as including inventory accumulation), and g_t real current government expenditure.[11] The world interest rate was set at 4% in all calculations reported below.[12]

The first step in the procedure is to obtain an estimate of θ, in order to construct the (stationary) consumption-smoothing component of the current account by removing the non-stationary component of the actual series (or, more specifically, the stochastic trend) associated with consumption tilting. This estimate can be obtained from a cointegrating regression which examines the relationship between private consumption c_t and $q_t - I_t - g_t$.[13] This relationship was estimated using the Phillips–Hansen FM method, which yields an asymptotically correct variance–covariance estimator when estimating cointegrating vectors in the presence of serial correlation and endogeneity (Phillips and Hansen, 1990). In our cointegrating regression of $q_t - I_t - g_t$ on c_t we obtained an estimate $\tilde{\theta}$ of 0.982, with a long-run standard error (as derived from the FM method) of 0.006. A t-test (with the standard variance estimator replaced by the standard error derived from the FM method) indicates that the estimated value is significantly different from unity. This estimate therefore indicates that France has consumed more than its permanent cash flow and has foregone future consumption in favor of present consumption.[14] By definition, as indicated above, the residual series from the cointegrating regression of $q_t - I_t - g_t$ on c_t is equal to CA_t, the actual consumption-smoothing component of the current account.

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[10] Quarterly data on nominal GNP (which are not published) were provided directly by the French National Statistical Office, INSEE. The real GNP series was constructed by using the implicit GDP deflator.

[11] Current account estimates based on national accounts data do not fully reflect nominal capital gains and losses on net foreign assets. In addition, our deflation procedure does not allow us to correct for the inflationary erosion of the real value of foreign assets. These limitations are common to most studies in this area.

[12] An annual world interest rate of 4% was used by Sheffrin and Woo (1990), and by Ostry and Levy (1995) in their analysis of the role of financial deregulation and intertemporal factors in the behavior of saving in France. We also estimated the model with a world interest rate equal to 2, 3, 5, and 6%. The results differed only marginally from those reported below. In particular, the ratio of the variance of the actual to the predicted current account tends to increase as ρ increases.

[13] Table A1 of the Appendix reports the results of unit root tests showing that the two series are $I(1)$. This is also the case for z_t.

[14] One reason for this divergence could be that with a positive probability of birth and death, the discount rate will be higher than the real rate of interest, as in the Blanchard–Yaari model.

The hypothesis of cointegration between $q_t - I_t - g_t$ and private consumption c_t was tested using the LC test of Hansen (1992), and the stability of the relationship between them was examined using Hansen's (Hansen, 1992) mean-F and sup-F tests. The LC test of the null hypothesis of a cointegrated relationship between $q_t - I_t - g_t$ and c_t does not reject the hypothesis: a value of 0.22 is the result; the 5% critical value (in the presence of a constant term) is 0.58. Furthermore, the Hansen stability tests indicate that the relationship between $q_t - I_t - g_t$ and c_t is stable — the null hypothesis of constant parameters in the FM cointegrating regression is not rejected. The mean-F and sup-F tests have values of 3.15 and 7.15; the corresponding critical values at the 5% significance level are 4.57 and 12.40, respectively.

One of the testable implications of the consumption smoothing model is that the current account should Granger-cause subsequent changes in the cash flow variable (Obstfeld and Rogoff, 1994). A current account deficit today, for instance, should signal an expected increase in future cash flows — associated, say, with an expected reduction in future government expenditure. A standard *F*-test of the null hypothesis of the absence of Granger causality from CA_t to Δz_t is rejected at the 10% level — it has a value of 2.70 and a *P*-value of approximately 0.1.

We then estimated the VAR system in terms of Δz_t and CA_t, with one lag and constant terms (see Table A2 of Appendix A). The intertemporal model described previously implies two restrictions on the parameter estimates derived from the VAR system under the null, namely, that the coefficient on Δz_t be equal to zero and that the coefficient on CA_t be equal to one in Eq. (10). Formally, let Γ denote the matrix multiplying the vector $[\Delta z_t \ \text{CA}_t]'$ in Eq. (10). Let $\Gamma = [\Gamma_z \ \Gamma_{\text{CA}}]$ be a conformable partition of the matrix Γ. The model therefore requires that $\Gamma_z = 0$ and $\Gamma_{\text{CA}} = 1$. Acceptance of these restrictions implies that movements of the actual consumption-smoothing current account CA_t reflect those of the optimal consumption-smoothing current account CA^*_t, constructed as in Eq. (10).

These joint restrictions were tested using a Wald test. The value of the test statistic (which is distributed as a χ^2 with two degrees of freedom) was *Wald* = 2.314 (with a *P*-value = 0.314), indicating strong acceptance of the restrictions. This suggests France had little difficulty in smoothing consumption through foreign borrowing and lending in the face of exogenous shocks. This is somewhat surprising, since during most of the estimation period (from the early 1970s to the mid-1980s) capital controls were in place — which in principle should have limited the ability of domestic residents to engage in international borrowing and lending.[15] Actual and predicted values of the consumption-smoothing current account are shown in Fig. 1. The figure shows indeed that the two series move closely together.

[15] For a discussion of the structure of capital restrictions prior to the mid-1980s, see Ministry of Finance (1994). The dismantling of capital controls began in 1984 (within the context of a general movement towards capital market integration in Europe), and was completed in 1990. For an overview of the liberalization process in recent years, see the annual reports on *Exchange Arrangements and Exchange Restrictions* published by the International Monetary Fund.

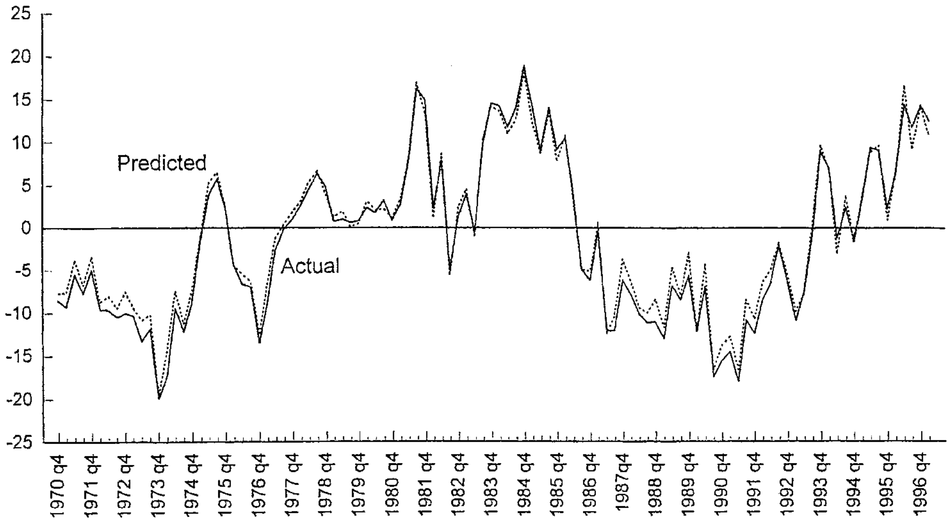

Fig. 1. France: actual and predicted consumption smoothing component of the current account (constant 1980 billion FF). World interest rate = 0.04.

Changes in national cash flows explain fairly well movements in the actual consumption-smoothing current account balance.

A further testable implication of the model is that the variance of CA_t and CA_t^* should be equal. Such a comparison provides a joint test of the assumption of a high degree of capital mobility and the validity of the intertemporal model of the current account (Ghosh, 1995). We found the variance of CA_t to be significantly larger than that of CA_t^* — by more than 15% in relative terms — indicating 'excess volatility' in the actual consumption-smoothing component of the current account. This result is similar to those obtained by Sheffrin and Woo (1990) and by Ghosh (1995) for Canada, Germany, Japan, and the United Kingdom. It suggests that capital flows between France and the rest of the world may have been more volatile than would be justified by expected changes in fundamentals.

4. Summary and conclusions

The purpose of this paper has been to estimate a simple intertemporal model of France's current account over the period 1970–1996, and to examine the extent to which it predicts recent developments. The key prediction of the model is that a country's current account will be in deficit (surplus) whenever national cash flow, defined as gross domestic product less investment and government spending, is expected to rise (fall) over time. Intuitively, if the cash flow is expected to grow over time, the country will find it optimal to borrow against future resources (that is, to increase its external debt) by running a current account deficit. If, by contrast, national cash flow is expected to fall over time — as might be the case if government spending were expected to increase in the future — the country would run a current account surplus (increase its savings, or reduce external indebtedness) today in order to maintain consumption in the future at a level consistent with permanent income.

Estimation results suggested that, despite its simplicity, the basic consumption-smoothing model explains fairly well fluctuations of the current account balance since the early 1970s, which is suggestive of a high degree of capital mobility between France and the rest of the world. This is consistent with recent evidence for other industrial countries. Our results are particularly remarkable in view of the fact that estimation was performed in part over a period during which France experienced large external shocks, and restrictions on overseas capital transactions (which should have limited, in principle, international borrowing and lending activities by domestic residents) were in place.[16] In addition, the model predicts correctly the sharp turnaround in France's external accounts observed in 1992 — a feature of the data that 'traditional' models of trade flows based on income and relative price variables, such as the model estimated by Agénor and Bismut (1995), appear to be unable to explain.[17] The improvement in the current account (or, equivalently, in net saving) appears to reflect a more pessimistic assessment by consumers of their future income prospects. In turn, the expected deterioration in income may have been related to the 1992–1993 recession (the largest in France since the end of the Second World War) and the associated increase in unemployment.

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[16] Our results are supported in part by those obtained by Frankel (1993), in a study aimed at quantifying the degree of capital mobility among industrial countries. His analysis showed that, on the basis of the variability of real interest rate differentials, France appears to have a high degree of integration with world capital markets — despite the apparent stringency of the capital controls that were in place until the mid-1980s.

[17] The optimal current account predicted by the consumption-smoothing model for the period 1992–1996 is on average lower than the actual current account balance, but the difference is not large.

Appendix A: Times series tests

This Appendix examines the time series properties of consumption (c_t), national disposable income ($q_t - I_t - g_t$), and national cash flow (z_t) series and conducts tests to determine the optimal lag length of the VAR of Eq. (8).

The Phillips–Perron $Z(\alpha)$ and $Z(t)$ unit root tests are used to determine the order of integration of the series.[18] The Fejer kernel is used, as is the prewhitening technique of Andrews and Monahan (1992) to aid in estimating the long-run variance of the error term in the unit root regression. Andrews' (1991) data-dependent automatic bandwidth selector is also invoked to determine the optimal lag truncation order.

The tests were sequenced from a maximum of two unit roots down to one unit root. At each stage an ordinary least squares regression of the form $x_t = \mu + \alpha x_{t-1} + \epsilon_t$ was run, where x_t (which is equal to c_t, z_t, or $q_t - I_t - g_t$) is in first difference form in the first stage, and in levels in the second stage. The results indicate that all of the series are non-stationary (Table A1). Both statistics testing for one unit root vs. no unit roots are insignificant, indicating that we cannot reject the null hypothesis of a unit root. Conversely, both statistics testing for two unit roots vs. at most one unit root are significant, which indicates we can reject the hypothesis of two unit roots — the three series are integrated of order one, or $I(1)$. Accordingly, both variables appearing in the VAR of Eq. (8) are stationary.

Table A1 Univariate unit root tests, 1970:1–1996:4[a]

Variable[b]	Tests[c]		
	α	$Z(\alpha)$	$Z(t)$
Two unit roots vs. at most one			
$\Delta(q - I - g)$	−0.3861	−141.6164	−15.7129
Δc	0.7217	−17.1156	−3.1352
Δz	−0.3441	−137.2845	−14.9697
One unit root vs. none			
$(q - I - g)$	0.9945	−0.4351	−0.9850
c	0.9943	−0.5748	−1.8431
z	0.9951	−0.4257	−0.9687

[a] The Phillips–Perron tests are based on the following model for any series, x: $x_t = \mu + \alpha x_{t-1} + \epsilon_t$. The tests rely on rejecting the null hypothesis of a unit root ($\alpha = 1$) in favor of stationarity. This hypothesis is tested by the $Z(\alpha)$ and $Z(t)$ tests. If the null cannot be rejected (the test statistics are not significant), then the series has a unit root.
[b] All series are in logarithms.
[c] The critical values for the $Z(\alpha)$ and $Z(t)$ tests at the 5% significance level are −12.5 and −3.0.

[18] See Dickey and Rossana (1994) for a discussion of Phillips–Perron tests of stationarity. These non-parametric tests have an advantage over the standard Dickey–Fuller tests in that nuisance parameters are (asymptotically) eliminated even if disturbances are not independent and identically distributed.

The number of lags in the VAR was determined on the basis of Akaike's Information Criterion (AIC) and the Schwarz Criterion (SC), the results of which are shown in Table A2. The AIC selects two lags, with no decisive difference between lags 1 through 4, whereas the SC clearly selects one lag.

Table A2 Determination of lag length in VARs[a,b]

Number of lags	Log likelihood	AIC	SC	ln{*R*(AIC)}	ln{*R*(SC)}
0	2462.207	7.809	7.809	118.530	111.834
1	257.437	5.632	5.738	0.972	0.000
2	232.952	5.614	5.825	0.000	4.698
3	224.073	5.657	5.973	2.322	12.690
4	205.762	5.653	6.075	2.106	18.198
5	195.678	5.685	6.212	3.834	25.596
6	183.914	5.704	6.337	4.860	32.346
7	181.150	5.771	6.509	8.478	41.634
8	175.333	5.820	6.664	11.124	50.004

[a]AIC is Akaike's infomation criterion and SC is Schwarz's criterion. They are both defined as the log likelihood plus some penalty adjustment involving the number of estimated parameters. The AIC penalty term is $2m^3n/T$, where m is the number of variables in the VAR, n is the number of lags, and T is the number of observations. The SC penalty term is $m^3n \ln(T)/T$. The minimum values of AIC and SC determine the best model.

[b]ln{*R*(●)} is the relative loss function to the best model, defined as ln{*R*(AIC)} = −0.5T{AIC(*lag**) − AIC(*lag*)} and ln{*R*(SC)} = −0.5T{SC(*lag**) − SC(*lag*)}, where *lag* is the number of lags and *lag** is the number of lags that deliver the minimum criterion value. A value greater than 3 indicates that there is no decisive difference in the number of lags selected.

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