Restatement of the I-O Coefficient Stability Problem

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Abstract The capacity of input-output tables to reflect the structural peculiarities of an economy and to forecast, on this basis, its evolution, depends essentially on the characteristics of the matrix A—matrix of I-O (or technical) coefficients. However, the temporal behaviour of these coefficients is yet an open question. In most applications, the stability of matrix A is usually admitted. This is a reasonable assumption only for a short-medium term. In the case of longer intervals, the question is much more complicated.

We shall empirically discuss this problem by using Romanian input-output tables. Our statistical option was motivated inter alia by the existence of official annual data for two decades (1989–2009).

As an introduction, Sect. 1 characterises the general framework of paper. Section 2—The main characteristics of I-O coefficients as statistical time series—examines the variability of technical coefficients expressed in both volume and value terms. The analysis is convergent to other previous works, confirming that the evolution of these coefficients in real and nominal terms is roughly similar. The main finding of this section is that, on one hand, the I-O coefficients are volatile, but on the other, they are serially correlated.

Consequently, Sect. 3—Attractor hypothesis—examines a possible presence of attractors in corresponding statistical series. The paper describes a methodology to approximate these using new indicators obtained by summation—in columns and rows—of the technical coefficients (colsums scaj and rowsums srai). The RAS method is involved as a connecting technique between these indicators and sectoral data.

Section 4—Conclusions—presents the main conclusions of the research and outlines several possible future developments. The database and econometric analysis are presented in Statistical and Econometric Appendix.

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1 Introduction

1. The capacity of input-output tables to reflect the structural peculiarities of the economy and to forecast, on this basis, its evolution, depends essentially on the characteristics of matrix A of I-O (or technical) coefficients. The so-called Leontief matrix \[(I - A)^{-1}\] has proven to be a powerful analytical tool in the investigation of propagated effects induced by inter-industry production chains. Our paper utilises the methodological framework developed in [23, 24, 28, 41, 44].

The temporal behaviour of I-O coefficients is yet an open question. In most applications, the stability of matrix A is usually assumed. This comes from both classical and extended interpretations of the Cobb–Douglas production function. According to Sawyer (p. 327 in [38]), “Under the first of these alternative hypotheses, the \(a_{ij}\) will be stable in volume terms. Under the second, the \(a_{ij}\) will be stable in value terms”. Generally, the relative stability of the technical coefficients can be considered as a reasonable assumption for a short-medium term. In the case of longer intervals, the question is much more complicated.

2. We shall empirically discuss this problem by using Romanian input-output tables. Our statistical option was motivated inter alia by the existence of official annual data for two decades (1989–2009).

These tables are built on an extended classification comprising 105 branches [17]. To simplify computational operations, the present research relates to a more compact version of 10 sectors [11, 33], as described in Table 1.

The correspondence of this collapsed structure to the original extended nomenclature is detailed in [12]. As in any aggregation, the one proposed in Table 1 implies some losses of information.

Nevertheless, the chosen analysis classification remains sufficiently complex and relevant to involve in this discussion some conceptual anchors of chaos theory. Specifically, we investigate whether the I-O coefficients series could contain sets of attractor points. To answer this question, a methodology for their numerical estimation will be applied to the available data.

3. The robustness of structural changes analysis and of the sectoral dynamic general equilibrium models depends mainly on the temporal behaviour of I-O coefficients. These can be estimated:

- in volume terms (at constant prices), denoted as \(c_{aij}\); and
- in value terms (at current prices), usually denoted as \(a_{ij}\).

The first estimation concerns the real economy, while the second relates to the nominal one. These determinations are mediated by the relative prices \(r_{Pij}\).

If \(cx_{ij}\) represents the part of sector i’s production (at constant prices \(p_{0ij}\)) used in sector j, and \(cX_j\) — total output of the sector j (at constant prices \(p_{0j}\)), then:

\[c_{aij} = cx_{ij}/cX_j\]
Table 1  Sectoral structure of the Romanian input-output tables

| Code | Definition |
|------|------------|
| 1    | Agriculture, forestry, hunting, and fishing |
| 2    | Mining and quarrying |
| 3    | Production and distribution of electric and thermal power |
| 4    | Food, beverages, and tobacco |
| 5    | Textiles, leather, pulp and paper, furniture |
| 6    | Machinery and equipment, transport means, other metal products |
| 7    | Other manufacturing industries |
| 8    | Constructions |
| 9    | Transports, post, and telecommunications |
| 10   | Trade, business, and public services |

and

\[ a_{ij} = \frac{x_{ij}}{X_j} \quad (2) \]

in which the same components of the above ratio are expressed in current prices \((p_i \text{ and } p_j, \text{ respectively})\).

Introducing the indices \(P_i = \frac{p_i}{p_{0i}}\) and \(P_j = \frac{p_j}{p_{0j}}\), we obtain

\[ a_{ij} = \frac{x_{ij}}{X_j} = cx_{ij}/(cX_j * P_j) = (cx_{ij}/cX_j) * (P_i/P_j) = ca_{ij} * reP_{ij} \quad (3) \]

where \(reP_{ij} = P_i/P_j\).

The I-O coefficients at constant prices were estimated using formula (3), which is equivalent to \(ca_{ij} = a_{ij}/reP_{ij}\).

Econometric estimations involve several aggregative indicators resulted from the technical coefficients in value terms, namely:

- Colsums \((sc_{ai})\), which summarises the I-O coefficients in columns,

\[ sc_{ai} = \sum_{j} a_{ij} \quad \text{with } j = \text{ fixed}; \quad i = 1, 2, \ldots, n \quad (4) \]

These approximate the weight of intermediary consumption in the total output of every sector.

- Rowsums \((sr_{ai})\), which summarises the I-O coefficients in rows,

\[ sr_{ai} = \sum_{i} a_{ij} \quad \text{with } i = \text{ fixed}; \quad j = 1, 2, \ldots, n \quad (5) \]

These approximate the contribution of each sector to the intermediary consumption of the entire economy.

2 The Main Characteristics of I-O Coefficients as Statistical Time Series

In the evaluation of the temporal features of I-O coefficients, three questions are relevant:
Do some peculiarities exist in the co-movement of I-O coefficients real-nominal expression?

Are I-O coefficients really stable?

Are these coefficients serially correlated?

The following sections attempt to find answers to these problems.

1. Relating to the first question, in principle the dynamics of real and nominal I-O coefficients are interdependent. On the supply side, the modifications in production costs (reflected by $c_{ij}$) influence the current prices of transactions. On the other hand, the changes in relative prices (reflected by $a_{ij}$) have an impact on the demand structure and, consequently, on the size of the output and the conditions (technology, human capital, etc.) in which this is achieved. Due to the complexity of economic life, in each historical period this interdependence has some specific features. This is the reason why statistical evaluation becomes important. Given these, the estimation of the synchronisation degree (SDa) of changes in $a_{ij}$ and $c_{ij}$ can be conclusive.

1.1. Starting from some proposals advanced in the literature about economic structures and cycles, three concrete formulae are considered.

(a) The first could be referred to as the cosine synchronisation degree (SDa1) since it is estimated as a vectorial angle between time series of I-O coefficients in their double expressions:

$$SDa1 = \sum_{t} (a_{ij,t} \ast c_{ij,t}) / \left[ \left( \sum_{t} a_{ij,t}^2 \right)^{1/2} \left( \sum_{t} c_{ij,t}^2 \right)^{1/2} \right]$$  \hspace{1cm} (6)

(b) The well-known correlation coefficient is often applied in statistical comparisons of real-nominal economic time series (see, for instance, [1, 8, 9, 16, 20, 26, 35, 39]). This Galtung–Pearson synchronisation degree (SDa2) is calculated as a ratio of covariance of series $a_{ij}$ and $c_{ij}$ to the product of their standard deviations, respectively:

$$SDa2 = \left( n \ast \sum_{t} a_{ij,t} \ast c_{ij,t} - \sum_{t} a_{ij,t} \ast \sum_{t} c_{ij,t} \right) / \left\{ \left[ \left( n \ast \sum_{t} a_{ij,t}^2 - \left( \sum_{t} a_{ij,t} \right)^2 \right) \right]^{1/2} \right\} \left\{ \left[ \left( n \ast \sum_{t} c_{ij,t}^2 - \left( \sum_{t} c_{ij,t} \right)^2 \right) \right]^{1/2} \right\}$$  \hspace{1cm} (7)

(c) A third method used in the economic literature for such analysis is worth mentioning [6, 9, 16]. We shall refer to it as the binary synchronisation degree (SDa3), which measures the proportion in which the compared series evolve in the same direction. Technically, a dummy variable is used, its value being 1 when the respective I-O coefficient increases, and 0 when it decreases or stagnates. If such an alternative assignment is denoted as $d_{aij}$ for series $a_{ij}$, and, correspondingly, as $d_{ca_{ij}}$ for series $c_{ij}$, then SDa3 is given as

$$Sda3 = \left\{ \sum_{t} (d_{aij,t} \ast d_{ca_{ij},t}) + (1 - d_{aij}) \ast (1 - d_{ca_{ij}}) \right\} / n$$  \hspace{1cm} (8)
1.2. The above described SDa1, SDa2, and SDa3 do not raise special computational problems, and moreover, are easy to interpret. They have been applied in the series of all 100 technical coefficients, and the obtained results are synthesised in Fig. 1. Therefore, 95 % of SDa1 is positioned within 0.75–1 limits, and only 5 % do not exceed 0.75. At the same time, SDa2 is less than 0.5 in only one-fourth of cases; it is between 0.5–0.75 in 12 % of cases, and exceeds 0.75 in the rest (63 %). The last indicator is even more conclusive: SDa3 is within 0.75–1 in 87 % of cases, and less than 0.65 in none of the cases.

Summarising, all calculated synchronisation degrees of changes in aij and caij indicate that the I-O coefficients in both their expressions—in volume and value terms—evolve in a similar manner.

1.3. A more nuanced understanding of this interdependence could be obtained by determining the global variability degree of changes in all I-O coefficients, avca for caij and ava for aij:

\[
\text{avca}_t = \sum_j \left( w_{qi} \ast \left( \sum_i (cai_{ijt} - cai_{ijt-1})^2 \right)^{1/2} \right) \\
\text{ava}_t = \sum_j \left( w_{qi} \ast \left( \sum_i (ai_{ijt} - ai_{ijt-1})^2 \right)^{1/2} \right)
\]

where \( w_{qi} \) represents the weight of sector \( i \) in the total output of economy.

Fig. 1  Synchronisation degree (SDa) of changes in aij and caij

n being the number of observations in the sample.
There were applied two unit root tests for ava and avca: ADF—Augmented Dickey–Fuller and PP—Phillips–Perron. All available options concerning the exogenous (no one, constant, constant plus linear trend) have been computed. The results are detailed in Table 2. Indulgently accepting the stationarity assumption, the pairwise Granger test statistically accredits a certain interconnection between the respective series only on a short run, with the causality direction from avca toward ava (probability of null hypothesis = 0.0881) for one lag, and converse, from ava toward avca (probability of null hypothesis = 0.0943) for two lags. More appropriate for non-stationary series, the test Toda–Yamamoto [43] indicates again on a short run (two lags) an influence of ava on avca (according to F-statistic, and Chi-square, the probability for null hypothesis “ava does not cause avca” represents 0.1107 and, respectively, 0.0869).

Except for 4 years (1991, 2002–2003, and 2005), the ratio of ava to avca was <1 in all periods. This means that the changes in relative prices somehow attenuated the shifts in technical coefficients in volume terms.

2. The examination of the co-movement pattern of changes in the real and nominal expressions of I-O coefficients does not clarify if these are relatively stable (small annual changes) or significantly volatile. This is important for our analysis.

In the case of I-O coefficients, we shall adopt a larger interpretation of volatility as an integrating measure of the frequency and size of the changes registered in their evolution. A comprehensive analysis of volatility determinants exceeds the thematic perimeter of this paper. Briefly, we recall the following factors:

- the performance of preponderantly used technologies that redound to most aspects of costs (labour productivity, energy and raw material intensities, quality of goods and services, length of productive cycles, etc.);
- the dimension, and structure of domestic demand, which influence the scale efficiency and relative prices;
- the openness degree of the country, with its impact on firms’ access to external markets, on import substitution effects, and on productive factors migration;
- the institutional reforms that have a great role in both emerging and developed economies; and
• the operational consequences of macroeconomic policies that can facilitate or, on the contrary, hinder the fructification of comparative advantages for the respective economy.

Quantitatively, the volatility of a given indicator will be approximated by its variation coefficient calculated (for the entire available time series) as follows. If \( q_t \) is the value of this indicator at moment \( t \) \((t = 1, 2, \ldots, s)\) and \( \omega_q \) its level admitted as referential, then this coefficient \( (C_V) \) is determined by

\[
C_V = \left[ \left( \sum_{t} \left( \frac{q_t}{\omega_q} - 1 \right)^2 \right) / s \right]^{1/2} \tag{11}
\]

In principle, \( \omega_q \) can differ depending on the objectives of analysis. As a first choice, we adopt the sample mean, accommodating expression (11) to the standard deviation formula largely used in modern statistics. Such an approach is suitable in forecasting the volatility for different interested horizons by simple extrapolation of its statistically registered level.

The proposed procedure consists of the following steps:

• For each interval two estimations of the respective indicator are determined: an upper and a lower level. The first is obtained by multiplying the mean of the previous series by \( (1 + C_V) \), while the other results similarly but using \( (1 - C_V) \) as a multiplier. We shall designate these values as \( Y \) for the upper level and \( y \) for the lower one.

• On this basis, two new means are also computed, mixing the corresponding previous series with \( Y \) and \( y \): they will be represented by the symbols \( M \) and \( m \), respectively. The statistical volatility is applied again by multiplying the new \( M \) by \( (1 + C_V) \) and \( m \) by \( (1 - C_V) \). This procedure is continued as much as it is considered useful (the forecast period being denoted by \( \tau = 1, 2, \ldots, n \)).

• The difference \( (Y - y) \) can be admitted as an error \( (\text{ef}_V) \) attributable to the initially estimated volatility. The interpretation of results would be facilitated by equalising the starting sample mean to unity.

More formally, for the upper level, we have

\[
Y_{\tau - 1} = (1 + C_V) * M_{\tau - 2}, \quad \tau = 1, 2, \ldots, n \tag{12}
\]

\[
M_{\tau - 1} = \left( (s + \tau - 2) * M_{\tau - 2} + Y_{\tau - 1} \right) / (s + \tau - 1)
= \left( (s + \tau - 2) * M_{\tau - 2} + (1 + C_V) * M_{\tau - 2} \right) / (s + \tau - 1)
= M_{\tau - 2} * (s + \tau - 2 + 1 + C_V) / (s + \tau - 1)
= M_{\tau - 2} * (s + \tau - 1 + C_V) / (s + \tau - 1)
= M_{\tau - 2} * (1 + C_V / (s + \tau - 1)) \tag{13}
\]

\[
Y_{\tau} = (1 + C_V) * M_{\tau - 1} = (1 + C_V) * M_{\tau - 2} * (1 + C_V / (s + \tau - 1)) \tag{14}
\]

A simplification can be obtained by passing to indices \( (\text{IY}_{\tau} = Y_{\tau} / Y_{\tau - 1}) \):

\[
\text{IY}_{\tau} = \left( (1 + C_V) * M_{\tau - 2} * (1 + C_V / (s + \tau - 1)) \right) / \left( (1 + C_V) * M_{\tau - 2} \right)
= (1 + C_V / (s + \tau - 1)) \tag{15}
\]
This relationship is valid for $\tau \geq 2$ since $Y_0 = M_0 = 1$ and $Y_1 = (1 + C_V) * M_0 = (1 + C_V)$. Finally, we have

$$Y_n = (1 + C_V) * \prod_{\tau} (1 + C_V / (s + \tau - 1)) \quad \text{for} \quad \tau = 2, \ldots, n \quad (16)$$

Symmetrically, the expression of $y_n$ is determined as

$$y_n = (1 - C_V) * \prod_{\tau} (1 - C_V / (s + \tau - 1)), \quad \text{again for} \quad \tau = 2, \ldots, n \quad (16a)$$

and

$$ef_{Vn} = \left[ (1 + C_V) * \prod_{\tau} (1 + C_V / (s + \tau - 1)) \right] - \left[ (1 - C_V) * \prod_{\tau} (1 - C_V / (s + \tau - 1)) \right] \quad (17)$$

Therefore, $ef_{Vn}$ is influenced mainly by $C_V$, $s$, and $\tau$. Figures 2(a) and 2(b) illustrate some indifference curves of the initial $C_V$ depending on $s$ and $m$, estimated under the conditions given in Table 3.

The presented algorithm can be used in establishing a kind of taxonomy scale of I-O coefficients volatility. Toward this aim, it would be necessary to determine the desirable levels of $ef_V$ and the length of $\tau$ (that is, the value of $n$). A possible starting point in this sense can be the expectable financial risk induced by economic decisions linked to forecasted I-O coefficients. Addressing this question requires further research. A possible solution to this problem could be adequately extrapolated in other socio-economic fields.

Returning to the Romanian I-O tables, the variation coefficient, based on formula (11), was computed for all statistical series in 1989–2009 (100 caij and 100 corresponding aij). The results are summarised in Table 4, which shows that there is no I-O coefficient with $C_V < 0.05$ and only one with $C_V < 0.1$; instead, 85 % of caij and 73 % of aij are characterised by $C_V > 0.3$. The hypothesis that the mean of all $C_V$ would be between 0.4–0.65 was tested for both series $C_Vcaij$ and $C_Vaij$. The results are presented in Fig. 3.

In many cases, the volatility is so high that the calculated $ef_V$ becomes abnormal even for very short intervals. As an example, the evolution of the error attributable to the initially estimated volatility ($ef_V$) was determined for three cases: for $C_V = 0.1$ (variant 1), $C_V = 0.2$ (variant 2), and $C_V = 0.3$ (variant 3), during $\tau = 1, 2, \ldots, 15$. The results of this exercise are denoted as $ef_V1$, $ef_V2$, and $ef_V3$, and are summarised in Fig. 4. We recall that the computed data represent indices comparatively to the mean level of the statistical series (the mean equalised to 1). For $C_V = 0.3$, the difference between the forecasted limits of the respective indicator can reach 0.7 in five years and 0.8 in ten. Even for $C_V = 0.1$, the potential forecasting error is hardly ac-
ceptable. As we have already shown, the levels calculated for Romanian I-O tables are overall much higher than the simulated (in Fig. 4) values of $C_V$.

3. Like other previous studies, the analysis of Romanian I-O tables confirms that the technical coefficients are volatile. What needs to be documented is the nature of this volatility, and the highly questionable factor is the presence of non-linearities in the respective statistical series. Such a possibility has been revealed in many economic indicators [3, 34]. In the case of Romanian I-O tables, we shall also examine whether the data regarding the technical coefficients are independent or, on the contrary, serially correlated.
Table 3 Estimation of the initial $C_V$ depending on $s$ and the final desirable $ef_V$

| Variant  | Forecasted interval | Final desirable $ef_V$ |
|----------|---------------------|------------------------|
| Cy050A   | 5                   | 0.05                   |
| Cy075A   | 5                   | 0.075                  |
| Cy100A   | 5                   | 0.1                    |
| Cy125A   | 5                   | 0.125                  |
| Cy050B   | 10                  | 0.05                   |
| Cy075B   | 10                  | 0.075                  |
| Cy100B   | 10                  | 0.1                    |
| Cy125B   | 10                  | 0.125                  |

Table 4 Tabulation of statistical variation coefficients ($C_V$)

| Limits of var. coeff. | $C_{Vcaij}$ | $C_{Vaij}$ |
|------------------------|-------------|------------|
| 0.05–0.1               | 1           | 1          |
| 0.1–0.2                | 5           | 11         |
| 0.2–0.3                | 9           | 15         |
| 0.3–0.4                | 15          | 11         |
| 0.4–0.5                | 16          | 23         |
| 0.5–0.6                | 16          | 12         |
| 0.6–0.7                | 10          | 5          |
| 0.7–0.8                | 9           | 10         |
| 0.8–0.9                | 8           | 6          |
| 0.9–1                  | 4           | 3          |
| >1                     | 7           | 3          |
| Total                  | 100         | 100        |

Fig. 3 Probability for the mean of $C_{Vcaij}$ and $C_{Vaij}$ to be situated between 0.4–0.65 (tabulated on abscissa)

It is widely accepted that: “The correlation sum in various embeddings can...be used as a measure of determinism in a time series” (p. 313 in [40]). The BDS test is sensitive to a large variety of possible deviations from independence in time series, including linear dependence, non-linear dependence, or chaos. Concerning this technique, our turns to the conceptual and applicative framework developed in [2, 6,
Thus, the null hypothesis of independent and identically distributed (i.i.d.) data is checked against an unspecified alternative.

For the I-O tables examined in this paper, the BDS test was applied to both categories of coefficients—at constant (caij) and current prices (aij). Concerning the embedding dimension, we sought to cover an extended range of possibilities. Due to the insufficient length of the statistical series, five such variants were adopted: 2, 3, 4, 5, and 6. As a principal guiding mark, the p-value for the tested null hypothesis was retained, computed for the sample data (normal probability) and for their random repetitions (bootstrap probability). Recent software provided both probabilities (normal and bootstrap) for three options related to the distance used for testing: the fraction of pairs, the standard deviations, and the fraction of range. Therefore, 30 p-values were computed for each technical coefficient, resulting in five dimensions, two tested series (original and bootstrap), and three distances.

The characterisation of the global distributions of the obtained p-values for all series of technical coefficients will be discussed. Two classifications are significant.

First, the p-values for all 3000 estimations are classified according to the following thresholds: under 0.05, 0.05–0.1, 0.1–0.25, and 0.25–1, presented in Fig. 5. This shows that in the case of caij, over 75% of p-values (2252) are below 0.05; if the group 0.05–0.1 is added, the proportion reaches 80%. The picture is similar for aij: almost 72% of tests are estimated with p-values of under 0.05, and approximately 76% have p-values of less than 0.1. This means that, generally, the series of I-O coefficients (either at constant or current prices) are not independent.
The second application sorts I-O coefficients depending on the number of registered BDS p-values under 0.05. Toward this aim, six classes are delimited: up to 5 times, 5–10, 10–15, 15–20, 20–25, and 25–30. Evidently, the sum of classes is equal to 100 (the totality of coefficients). Figure 6 synthesises this distribution, showing that in each of the 86 $c_{aij}$, at least 15 tests had p-values of under 0.05. The result is no different in the case of $a_{ij}$ coefficients: among 90 cases, at least 10 p-values were under 0.05. The similarity of the $c_{aij}$ and $a_{ij}$ series suggests that the volatility of relative prices does not substantially influence the presence of serial correlation in the data.

Thus, in this section, we can conclude that, on one hand, the I-O coefficients are volatile, but on the other, they are serially correlated. Both statements have statistical support. More simply stated, we acknowledge a paradox because the high volatility indicates rather the presence of a quasi-disorder, while the serial correlation indicates a possible stable pattern in the analysed time series. The following section focuses on this exciting matter.

3 Attractor Hypothesis

The revealed contradictory combination of relatively high volatility of data and their consistent serial correlation generates a legitimate question: Is this contradiction a sign of a possible presence of an attractor in statistical series?

1. Generally, an attractor is considered a point or a closed subset of points (lines, surfaces, volumes), toward which a given system tends to evolve independently of its initial (starting) state [29–31, 36, 37]. Three types are frequently mentioned:
   - stable steady states,
   - different types of cycles, and
   - strange attractors.

The first type is relatively usual in Economics (“At best, the notion of equilibrium might, in practice, be identified with the notion of <attractor>”; p. 34 in [14]). The list of such examples is long, from the optimal rates of accumulation to the extended palette of Phillips curves.

Such points or lines need to be regarded rather as historical (that is, contextually determined) phenomena than as permanent, inflexible benchmarks. It is worth mentioning that some authors considered the “natural rate of unemployment” as a rather weak attractor (p. xiii in [4]).
Taking into account the numerous such applications in economics, the following systematisation of types of stable steady states would be useful:

- stable points,
- constant rates of movement (in different expressions, such as indices, elasticities, ratios, spreads, etc.), and
- bands of evolution.

All these are interesting perspectives in researching I-O tables. However, such a target would require many and sustained efforts. Our target is very narrow, namely, to attempt to identify in the studied statistical series some fixed points as possible attractors. This hypothesis will be used in two sub-variants: fixed points as such or slightly variable points with gradually decreasing influence of unknown factors (cumulated over a time parameter). Besides, the econometric analysis will concentrate on the dynamics of each I-O coefficient, considered separately and not in connection with other series.

Therefore, the evolution of I-O coefficients is conceived as an auto-regressive adaptive process, the differences between their actual and long-run levels being influenced by the past deviations. In the simplest form, such an application for Romanian input-output tables was developed in [10]. In a general notation, if $y$ is the time series of interest, we would have the following relationship:

$$y_t = \tilde{y} - \alpha \ast (y(-1) - \tilde{y}) = \tilde{y} \ast (1 + \alpha) - \alpha \ast y(-1)$$

(18)

where $\tilde{y}$ represents the long-run levels of $y$ (or the attractor according to this paper’s terminology). It is assumed that $0 < |\alpha| < 1$, which means that $y$ tends asymptotically towards $\tilde{y}$. Correspondingly, the first-order difference operator $d(y)$ is defined as

$$d(y) = y - y(-1) = \tilde{y} \ast (1 + \alpha) - \alpha \ast y(-1) - y(-1)$$

$$= \tilde{y} \ast (1 + \alpha) - (1 + \alpha) \ast y(-1) = a_0 - a_1 \ast y(-1)$$

(19)

The expression (19) contains the equivalencies $a_0 = \tilde{y} \ast (1 + \alpha)$ and $a_1 = (1 + \alpha)$.

To be more realistic, this determination will be relaxed by two amendments. On one hand, the last formula will be extended, with gradually diminishing influence of time. On the other, the auto-regressive process may involve lags of higher orders, not only of the first one, as in (19).

2. Even under such modifications, the approximation of possible attractor points requires the presence of at least one non-differentiated observation in the computational formula. Therefore, it would be preferable to use the statistical series stationary in levels ($I(0)$). Unfortunately, most of the available data do not observe such a restriction. From this point of view, two already mentioned unit root tests were applied: ADF—Augmented Dickey–Fuller and PP—Phillips–Perron test. Each was computed in three versions for the exogenous variables:

- none (denoted as 1),
- individual effects (denoted as 2), and
- individual effects and individual linear trends (denoted 3).
The p-values calculated for all 100 technical coefficients were grouped as follows: 0–0.05, 0.05–0.1, 0.01–0.25, and 0.25–1.

The corresponding distribution for the technical coefficients at constant prices (ca_{ij}) is presented in Figs. 7 and 8. Both unit root tests (ADF and PP) show that in around 80% of the cases, the p-values exceed 0.1. The same result is found for the technical coefficients at current prices (see Figs. 9 and 10).

At this point, we are confronted with a problem. The BDS test indicated the presence of temporal correlation in the data for technical coefficients (either at constant or at current prices). As previously mentioned, this finding would justify the identification of possible attractor points in their evolution. Since the series are not stationary in levels, in order to avoid the calculation of attractor points (as levels) by first- or second-order differentiation (a difficult computational task), an indirect way to approximate such points will be proposed.

The first step is to determine colsums (sc_{aij}) and rowsums (sr_{aij}) for the technical coefficients at current prices. The resulting series are given in Statistical and Econo-
metric Appendix. With respect to these time series, PANEL analysis did not reveal compelling signs of common explicative parameters. For this reason, they were examined separately. Table 5 shows the p-values of the ADF and PP tests for the scai series. In only three cases (sca2, sca3, and sca4) are the corresponding p-values situated in the proximity of 0.25. Consequently, the series scai will be used as such in regressions.

Table 6 presents the same indicators for srai. The introduction of econometric estimations for series sra5, sra8, and sra10 as such would clearly be too risky. Consequently, the first two were recalculated by the Hodrick–Prescott filter, obtaining for each the sub-series denoted as HP and HPd (difference between filter and primary data), respectively. The third series (sra10) was replaced with the corresponding logarithms. Table 7 shows the unit root test results, based on which the new series for sra5, sra8, and sra10 were used in regressions.

The formula (19) with the mentioned amendments was investigated using different specifications. The proposed selection considered, beside the mentioned premises,
Table 5  ADF and PP tests for sca_i

| Variable | Exogenous                  | ADF      |               | PP       |               |
|----------|----------------------------|----------|---------------|----------|---------------|
|          |                            | t-statistic | Prob.         | t-statistic | Prob.        |
| sca1     | Constant, linear trend     | −4.54901 | 0.009         | −4.52912 | 0.0094       |
| sca2     | Constant                   | −2.02573 | 0.274         | −2.00889 | 0.2809       |
| sca3     | Constant                   | −3.98533 | 0.0073        | −2.00269 | 0.2833       |
| sca4     | Constant, linear trend     | −4.79669 | 0.0072        | −2.85646 | 0.1956       |
| sca5     | Constant, linear trend     | −6.12916 | 0.0005        | −3.86767 | 0.0339       |
| sca6     | Constant, linear trend     | −5.45292 | 0.0026        | −3.4261  | 0.0761       |
| sca7     | Constant                   | −4.76606 | 0.0018        | −2.99545 | 0.0525       |
| sca8     | Constant                   | −5.00001 | 0.0008        | −7.99152 | 0        |
| sca9     | Constant                   | −4.47988 | 0.0028        | −2.81411 | 0.0741       |
| sca10    | Constant, linear trend     | −4.43914 | 0.012         | −7.71446 | 0            |

Table 6  ADF and PP tests for sra_i

| Variable | Exogenous                  | ADF      |               | PP       |               |
|----------|----------------------------|----------|---------------|----------|---------------|
|          |                            | t-statistic | Prob.         | t-statistic | Prob.        |
| sra1     | Constant, linear trend     | −3.06826 | 0.1399        | −1.59124 | 0.1031       |
| sra2     | Constant                   | −2.94275 | 0.0581        | −2.91376 | 0.0614       |
| sra3     | Constant                   | −3.51945 | 0.0183        | −3.51945 | 0.0183       |
| sra4     | Constant                   | −2.6057  | 0.1083        | −2.6057  | 0.1083       |
| sra5     | Constant, linear trend     | −2.28894 | 0.4194        | −2.54869 | 0.3041       |
| sra6     | None                       | −2.36343 | 0.0209        | −2.17192 | 0.0319       |
| sra7     | Constant, linear trend     | −4.96559 | 0.0044        | −2.84798 | 0.1981       |
| sra8     | Constant, linear trend     | −2.34672 | 0.3929        | −1.90162 | 0.6163       |
| sra9     | Constant                   | −2.91805 | 0.0609        | −2.91805 | 0.0609       |
| sra10    | Constant                   | −1.22677 | 0.6415        | −1.28041 | 0.6175       |

the results of tests for omitted or redundant variables, and outliers, also. It has also tried to reduce the econometric compromises as much as possible. For the current paper, several types of relationships were retained according to the scheme given in Table 8. Sometimes dummy variables were introduced to decrease the influence of data outliers.

3. The OLS-solution of system SyS1scr (Statistical and Econometric Appendix) was submitted to econometric controls from four standpoints: (a) variance inflation factors, (b) Breusch–Pagan–Godfrey heteroskedasticity test, (c) correlogram squared residuals, and (d) stationarity of residuals.

Concerning the variance inflation factors (Table 9), it is conclusive that more than 77 % of the centred VIFs do not exceed 2, and approximately 15 % are situated between 2 and 3; even the rest do not surpass 5.3. Based on these results, we could accept that the specification of the system SyS1scr is not contaminated in an alarming manner by collinearity effects.
The test Breusch–Pagan–Godfrey (Table 10) indicates high enough probabilities for the rejection of heteroskedasticity hypothesis.

The correlogram of squared residuals was computed for five lags (Table 11). In most cases, Q-statistics are associated with relatively large p-values, which attest a weak serial correlation in the residuals.

Concerning the stationarity of residuals, both unit root tests ADF and PP were applied again, in all available options for exogenous (Table 12). There were thus generated 132 values of the probability the respective residual has a unit root. Out of these, 76.52 % are placed under 0.05, and 10.61 % between 0.05–0.1.

The above presented tests (for collinearity, heteroskedasticity, serial correlation, and stationarity of residuals) show that OLS could be acceptable to estimate the system SyS1scr.

4. The system SyS1scr has been solved using other four techniques: Weighted Least Squares (WLS), Seemingly Unrelated Regression (SUR), Generalised linear models (GLM), and Generalised Method of Moments (GMM). The obtained results are detailed in Statistical and Econometric Appendix.

The solution induced by Weighted Least Squares slightly ameliorates the standard errors, maintaining, however, the parameters of equations practically at the same level as OLS. The differences between Seemingly Unrelated Regression and OLS re-

Table 7 ADF and PP tests for derived series sra5, sra8, and sra10

| Variable   | Exogenous | ADF t-statistic | ADF Prob. | PP t-statistic | PP Prob. |
|------------|-----------|-----------------|-----------|----------------|----------|
| sra5HP     | None      | -2.48196        | 0.0168    | -1.41255       | 0.1422   |
| sra5HPd    | None      | -5.36025        | 0         | -3.91121       | 0.0005   |
| sra8HP     | Constant  | -3.84112        | 0.0116    | -2.06376       | 0.5334   |
| sra8HPd    | None      | -3.73356        | 0.0008    | -3.89625       | 0.0005   |
| sra10      | None      | -4.16256        | 0.0003    | -5.48654       | 0        |

Table 8 Main econometric relationships

| Variables | Specification |
|-----------|---------------|
| sra5, sra2, sra4, sra9, log(sra10) | d(y) = a0 + a1 * y(-1), with possible a1 * y(-3) or a2 * d(y, 2) |
| sra8, sra10 | d(y) = b0 + b1 * y(-1) + b2 * t/(t + 1), with possible b0 = 0 |
| sra2, sra3, sra5HPd | d(y) = c0 + c1 * y(-1) + c2 * d(y(-1)), with possible c0 = 0 or c1 * y(-2) |
| sra5, sra6, sra9 | d(y) = d0 + d1 * y(-1) + d2 * d(y(-1)) + d3 * d(y(-2)) + d4 * t/(t + 1), with possible d3 = 0 |
| sra8HP, sra8HPd | d(y) = e0 + e1 * y(-1) + e2 * d(y, 2), with possible e0 = e1 = 0 |
| sca7, sra5HP | d(y) = f0 + f1 * y(-1) + f2 * d(y(-1)) + f3 * d(y(-2)) + f4 * d(y(-3)) + f5 * t/(t + 1) with possible f2 = f3 = f5 = 0 |
| sra1, sra6 | d(y) = g0 + g1 * y(-1) + g2 * d(y(-1)) + g3 * t^{-1}, with possible g2 * d(y(-2)) |
| sra3 | d(y) = h0 + h1 * y(-3) + h2 * t^{-1} |
| sra4, sra7 | d(y) = i0 + i1 * y(-2) + i2 * d(y, 2) + i3 * t/(t + 1) or i3 * t^{-1} |
Table 9  Variance Inflation Factors—SyS1scr

| Variable Coefficient variance | Uncentred VIF | Centred VIF | Variable Coefficient variance | Uncentred VIF | Centred VIF |
|-------------------------------|---------------|-------------|-------------------------------|---------------|-------------|
| c(1)                          | 0.007439      | 181.7134 NA | c(39)                         | 0.024642      | 1.450884 1.315947 |
| c(2)                          | 0.032656      | 182.2648 1.009286 | c(40)                         | 0.109405      | 22.57514 5.223014 |
| c(501)                        | 0.00087       | 1.062407 1.009286 | c(510)                        | 0.001322      | 1.149574 1.085709 |
| c(3)                          | 0.003984      | 74.7162 NA  | c(41)                         | 0.010673      | 94.24219 NA |
| c(4)                          | 0.00863       | 74.77052 1.17408 | c(42)                         | 0.035631      | 93.71807 2.198215 |
| c(5)                          | 0.014339      | 1.296515 1.292649 | c(43)                         | 0.014986      | 2.11911 2.11897 |
| c(6)                          | 0.001936      | 128.8835 NA | c(511)                        | 0.002527      | 1.174249 1.112446 |
| c(7)                          | 0.003913      | 153.3235 1.466782 | c(44)                         | 0.020214      | 88.31065 NA |
| c(8)                          | 0.007181      | 6.302923 1.458253 | c(45)                         | 0.043413      | 87.61261 1.624957 |
| c(9)                          | 0.025715      | 440.5265 NA | c(46)                         | 0.044123      | 1.654492 1.645571 |
| c(10)                         | 0.014377      | 1123.768 4.799226 | c(512)                        | 0.004665      | 1.072668 1.016212 |
| c(11)                         | 0.003776      | 1.17145 1.169737 | c(47)                         | 0.003327      | 95.02657 NA |
| c(12)                         | 0.008835      | 1235.916 4.601097 | c(48)                         | 0.021225      | 94.48058 1.093589 |
| c(505)                        | 0.000188      | 1.696676 1.607377 | c(513)                        | 0.000796      | 1.128173 1.071764 |
| c(13)                         | 0.019685      | 1392.005 NA | c(514)                        | 0.000754      | 1.077272 1.023409 |
| c(14)                         | 0.024542      | 623.8674 1.638509 | c(49)                         | 2.81E-06      | 426.7166 NA |
| c(15)                         | 0.016727      | 1.35002 1.347123 | c(50)                         | 1.05E-05      | 395.778 2.751647 |
| c(16)                         | 0.00631       | 364.5846 1.357284 | c(51)                         | 0.000234      | 3.754934 2.751647 |
| c(17)                         | 0.034858      | 1965.638 NA | c(52)                         | 0.025272      | 1.796378 NA |
| c(18)                         | 0.030144      | 650.8176 2.390064 | c(53)                         | 0.016926      | 1.920122 NA |
| c(19)                         | 0.023574      | 1.422988 1.404814 | c(515)                        | 0.000178      | 1.170656 NA |
| c(20)                         | 0.011187      | 515.4273 1.918844 | c(516)                        | 0.000184      | 1.211256 NA |
| c(21)                         | 0.081562      | 8973.245 NA | c(54)                         | 0.003218      | 19.90196 NA |
| c(22)                         | 0.092117      | 5429.118 3.120946 | c(55)                         | 0.007158      | 20.39908 1.264573 |
| c(23)                         | 0.042363      | 2.079116 2.060516 | c(56)                         | 0.017469      | 1.220558 1.218342 |
| c(24)                         | 0.031891      | 1.948496 1.866357 | c(517)                        | 0.003526      | 1.147892 1.087476 |
| c(25)                         | 0.033425      | 2.002502 1.928123 | c(57)                         | 0.014686      | 248.5112 NA |
| c(26)                         | 0.012829      | 1189.042 1.690041 | c(58)                         | 0.007722      | 281.5666 1.506779 |
| c(27)                         | 0.002979      | 389.7016 NA | c(59)                         | 0.003002      | 1.016724 1.00456 |
| c(28)                         | 0.009449      | 388.3649 1.064145 | c(60)                         | 0.015966      | 4.954369 1.509934 |
| c(29)                         | 0.005972      | 1.198711 1.182468 | c(61)                         | 6.02E-06      | 47.60604 NA |
| c(506)                        | 0.000171      | 1.178583 1.116553 | c(62)                         | 1.66E-04      | 23.38802 1.507298 |
| c(30)                         | 0.005762      | 1013.246 NA | c(63)                         | 1.57E+00      | 11.50596 1.668578 |
| c(31)                         | 0.027859      | 860.7738 1.847807 | c(518)                        | 2.77E-06      | 1.152835 1.092159 |
| c(32)                         | 0.019306      | 2.0286 2.028597 | c(519)                        | 2.94E-06      | 1.223618 1.159217 |
| c(33)                         | 0.003382      | 494.3642 1.101297 | c(64)                         | 0.006251      | 1.235811 NA |
| c(34)                         | 0.000142      | 1.385103 1.308153 | c(520)                        | 0.000222      | 1.133899 NA |
| c(35)                         | 0.003491      | 324.9721 NA | c(521)                        | 0.000216      | 1.101912 NA |
Table 9 (Continued)

| Variable | Coefficient variance | Uncentred VIF | Centred VIF | Variable | Coefficient variance | Uncentred VIF | Centred VIF |
|----------|----------------------|---------------|-------------|----------|----------------------|---------------|-------------|
| c(36)    | 0.005765             | 95.10627      | 1.474381    | c(66)    | 0.017978             | 19.27486      | 1.020607    |
| c(508)   | 0.000506             | 2.661904      | 2.528809    | c(522)   | 0.003492             | 1.066213      | 1.012902    |
| c(509)   | 0.000219             | 1.151599      | 1.094019    | c(523)   | 0.003497             | 1.067792      | 1.014402    |
| c(37)    | 0.011343             | 177.5241      | NA          | c(67)    | 0.000826             | 3.416318      | NA          |
| c(38)    | 0.042122             | 285.9858      | 4.932777    | c(68)    | 0.000602             | 3.868874      | 1.182485    |
| c(524)   | 0.00545              |               |             | c(524)   | 0.00545              | 1.252043      | 1.182485    |

Regarding estimators and coefficients of determination are also insignificant. The same conclusion is valid for the Generalised Linear Models (applied with bootstrap).

The Generalised Method of Moments was involved in variant HAC for the time series (Bartlett and Variable Newey–West). Despite the large number enough of trials, the results were inconclusive. First, in order to obtain a plausible solution, it was necessary to break SyS1scr into three sub-systems—SyS1scaG, SyS1sraG, and SyS1sra8G—which have been separately computed. Secondly, the algorithm did not work with dummies, or these were not introduced casually, but according to the specification test about outliers.

Briefly, the comparative analysis of different techniques suggests as acceptable OLS method. Nevertheless, a problem persists. According to Statistical and Econometric Appendix (System Residual Cross-Correlations—OLS), the disturbances of some relationships represented in SyS1scr are correlated. They reflect, at great extent, the indubitable fact of inter-industry linkages. Obviously, there must be a consistent solution of the question hereby discussed. It could result from a re-specification of the entire system by explicit inclusion in the equations of the factors inducing cross-correlations among input-output technical coefficients, and subsequently applying computational methods that avoid simultaneity effects. But such an approach should need further interdisciplinary research. Until then, I am reluctant to involve techniques which somehow mechanically constrain the cross-correlations of I-O coefficients. Consequently, for the present OLS will keep being involved in the succeeding steps of our approach.

5. Based on the previous system, the fitted sca$_f$ and sra$_f$ can be obtained, but not a$_{ij}$ as such. To approximate these, the RAS technique was applied. During its half-century existence [42], this method has registered extended applications, including in recent researches [7, 18, 19, 21, 22, 25, 27]. Usually, the starting matrix for every $t$ is the statistical matrix $A_{t-1}$, which is adjusted by successive bi-proportional corrections in dependence on exogenously given sectoral outputs. The applicability of such a method for an emergent economy such as in Romania has already been documented [13].

The present paper slightly modifies this procedure, using sca$_f$ and sra$_f$ as column and row restrictions in a RAS algorithm. The resulting technical coefficients (denoted as r$_{ij}$) are relevant from the present research perspective. Notably, r$_{ij}$ are calculated using the fitted sca$_f$ and sra$_f$. The formulae, however, are based on the hypothesis that the respective original statistical series contain attractor points. Consequently, the
Table 10  SyS1scr: heteroskedasticity test Breusch–Pagan–Godfrey

| Dependent variable: d(sca1) | Dependent variable: d(sra2) |
|-----------------------------|-----------------------------|
| F-statistic                | 0.901062                    | F-statistic                | 1.017491 |
| Obs*R-squared              | 1.916936                    | Obs*R-squared              | 4.279439 |
| Scaled explained SS        | 0.928978                    | Scaled explained SS        | 0.96349  |

| Obs*R-squared              | 0.4247                      | Obs*R-squared              | 0.4318  |
| Scaled explained SS        | 0.928978                    | Scaled explained SS        | 0.928978 |

| Dependent variable: d(sca2) | Dependent variable: d(sra3) |
|-----------------------------|-----------------------------|
| F-statistic                | 0.493489                    | F-statistic                | 0.610519 |
| Obs*R-squared              | 2.347896                    | Obs*R-squared              | 2.067521 |
| Scaled explained SS        | 1.07891                     | Scaled explained SS        | 0.52206 |

| Obs*R-squared              | 0.7408                      | Obs*R-squared              | 0.6185  |
| Scaled explained SS        | 1.07891                     | Scaled explained SS        | 0.914  |

| Dependent variable: d(sca3) | Dependent variable: d(sra4) |
|-----------------------------|-----------------------------|
| F-statistic                | 0.880908                    | F-statistic                | 0.329585 |
| Obs*R-squared              | 2.858248                    | Obs*R-squared              | 1.16401 |
| Scaled explained SS        | 2.466576                    | Scaled explained SS        | 0.798201 |

| Obs*R-squared              | 0.4746                      | Obs*R-squared              | 0.7616  |
| Scaled explained SS        | 2.466576                    | Scaled explained SS        | 0.8499 |

| Dependent variable: d(sca4) | Dependent variable: d(sra5HP) |
|-----------------------------|--------------------------------|
| F-statistic                | 1.613982                     | F-statistic                | 0.335166 |
| Obs*R-squared              | 7.277122                     | Obs*R-squared              | 0.76401 |
| Scaled explained SS        | 7.487449                     | Scaled explained SS        | 0.343187 |

| Obs*R-squared              | 0.2249                      | Obs*R-squared              | 0.6285  |
| Scaled explained SS        | 7.487449                    | Scaled explained SS        | 0.8423 |

| Dependent variable: d(sca5) | Dependent variable: d(sra5HPd) |
|-----------------------------|--------------------------------|
| F-statistic                | 0.757351                     | F-statistic                | 0.651693 |
| Obs*R-squared              | 2.499355                     | Obs*R-squared              | 2.982437 |
| Scaled explained SS        | 3.524105                     | Scaled explained SS        | 1.916603 |

| Obs*R-squared              | 0.5352                      | Obs*R-squared              | 0.5608  |
| Scaled explained SS        | 3.524105                    | Scaled explained SS        | 0.7511 |
Table 10 (Continued)

| Dependent variable: d(sca6) | F-statistic | Prob. F(3.15) | Obs*R-squared | Prob. Chi-Square(3) | Scaled explained SS | Prob. Chi-Square(3) |
|-----------------------------|-------------|---------------|---------------|--------------------|--------------------|--------------------|
| F-statistic                 | 0.498536    | 0.6889        | Obs*R-squared | 2.547519           | Prob. Chi-Square(4) | 0.6361             |
| Obs*R-squared               | 1.722675    | 0.6319        | Scaled explained SS | 2.828426 | Prob. Chi-Square(4) | 0.5869             |
| Scaled explained SS         | 2.27106     | 0.5181        |               |                    |                    |                    |

| Dependent variable: d(sca7) | F-statistic | Prob. F(5.11) | Obs*R-squared | Prob. Chi-Square(5) | Scaled explained SS | Prob. Chi-Square(5) |
|-----------------------------|-------------|---------------|---------------|--------------------|--------------------|--------------------|
| F-statistic                 | 0.776423    | 0.5866        | Obs*R-squared | 0.437113           | Prob. Chi-Square(4) | 0.9793             |
| Obs*R-squared               | 4.434583    | 0.4887        | Scaled explained SS | 0.426564 | Prob. Chi-Square(4) | 0.9802             |
| Scaled explained SS         | 1.311754    | 0.9337        |               |                    |                    |                    |

| Dependent variable: d(sca8) | F-statistic | Prob. F(4.14) | Obs*R-squared | Prob. Chi-Square(4) | Scaled explained SS | Prob. Chi-Square(4) |
|-----------------------------|-------------|---------------|---------------|--------------------|--------------------|--------------------|
| F-statistic                 | 1.183406    | 0.3604        | Obs*R-squared | 6.399829           | Prob. Chi-Square(5) | 0.2692             |
| Obs*R-squared               | 4.800931    | 0.3083        | Scaled explained SS | 2.752073 | Prob. Chi-Square(5) | 0.7381             |
| Scaled explained SS         | 4.819883    | 0.3063        |               |                    |                    |                    |

| Dependent variable: d(sca9) | F-statistic | Prob. F(5.12) | Obs*R-squared | Prob. Chi-Square(5) | Scaled explained SS | Prob. Chi-Square(5) |
|-----------------------------|-------------|---------------|---------------|--------------------|--------------------|--------------------|
| F-statistic                 | 0.63052     | 0.6804        | Obs*R-squared | 4.141061           | Prob. Chi-Square(5) | 0.5293             |
| Obs*R-squared               | 3.745019    | 0.5867        | Scaled explained SS | 1.882761 | Prob. Chi-Square(5) | 0.8651             |
| Scaled explained SS         | 1.619852    | 0.8988        |               |                    |                    |                    |

| Dependent variable: d(sca10) | F-statistic | Prob. F(4.15) | Obs*R-squared | Prob. Chi-Square(4) | Scaled explained SS | Prob. Chi-Square(4) |
|-----------------------------|-------------|---------------|---------------|--------------------|--------------------|--------------------|
| F-statistic                 | 0.928894    | 0.4733        | Obs*R-squared | 1.061723           | Prob. Chi-Square(3) | 0.7863             |
| Obs*R-squared               | 3.970571    | 0.41          | Scaled explained SS | 0.863016 | Prob. Chi-Square(3) | 0.8343             |
| Scaled explained SS         | 2.66595     | 0.6152        |               |                    |                    |                    |

| Dependent variable: d(sra1)  | F-statistic | Prob. F(5.12) | Obs*R-squared | Prob. Chi-Square(5) | Scaled explained SS | Prob. Chi-Square(5) |
|-----------------------------|-------------|---------------|---------------|--------------------|--------------------|--------------------|
| F-statistic                 | 0.476573    | 0.7871        | Obs*R-squared | 2.755483           | Prob. Chi-Square(2) | 0.2521             |
| Obs*R-squared               | 2.982131    | 0.7027        | Scaled explained SS | 1.404621 | Prob. Chi-Square(2) | 0.4954             |
| Scaled explained SS         | 0.508079    | 0.9918        |               |                    |                    |                    |
Table 11  Correlogram of residuals squared—S_yS1scr

| Lag | Dependent variable: d(sca1) | Dependent variable: d(sca3) | Dependent variable: d(sra5HP) |
|-----|------------------------------|------------------------------|--------------------------------|
|     | AC   | PAC | Q-statistic | Prob. | AC   | PAC | Q-statistic | Prob. | AC   | PAC | Q-statistic | Prob. |
| 1   | 1.168 | 0.5983 | 0.439 | 0.127 | 0.127 | 0.3738 | 0.541 | 0.276 | 0.276 | 1.6847 | 0.194 |
| 2   | 0.038 | 0.6304 | 0.73  | 0.004 | 0.012 | 0.3743 | 0.829 | 0.286 | 0.285 | 1.9394 | 0.379 |
| 3   | 0.044 | 0.6771 | 0.879 | 0.171 | 0.175 | 1.1293 | 0.77  | 0.238 | 0.242 | 3.3536 | 0.34  |
| 4   | 0.009 | 0.6789 | 0.954 | 0.259 | 0.225 | 2.9779 | 0.562 | -0.097 | -0.202 | 3.6057 | 0.462 |
| 5   | -0.198 | 1.7687 | 0.88  | -0.308 | -0.394 | 5.763  | 0.33  | 0.004 | 0.173 | 3.6061 | 0.607 |

| Lag | Dependent variable: d(sca2) | Dependent variable: d(sca9) | Dependent variable: d(sra5HPd) |
|-----|------------------------------|------------------------------|--------------------------------|
|     | AC   | PAC | Q-statistic | Prob. | AC   | PAC | Q-statistic | Prob. | AC   | PAC | Q-statistic | Prob. |
| 1   | 0.092 | 0.092 | 0.1874 | 0.665 | 0.087 | 0.087 | 0.1621 | 0.687 | 0.033 | 0.033 | 0.0247 | 0.875 |
| 2   | 0.174 | 0.167 | 0.9021 | 0.637 | 0.144 | 0.152 | 0.6266 | 0.731 | 0.106 | 0.107 | 0.2871 | 0.866 |
| 3   | -0.118 | -0.093 | 1.2507 | 0.741 | -0.101 | -0.133 | 0.871  | 0.832 | 0.117 | 0.126 | 0.6284 | 0.89  |
| 4   | 0.047 | 0.004 | 1.31  | 0.86  | -0.169 | -0.228 | 1.6068 | 0.808 | -0.143 | -0.17 | 1.1734 | 0.882 |
| 5   | -0.056 | -0.018 | 1.3989 | 0.924 | 0.086 | -0.003 | 1.8114 | 0.875 | -0.259 | -0.226 | 3.0863 | 0.687 |

| Lag | Dependent variable: d(sca3) | Dependent variable: d(sca10) | Dependent variable: d(sra6) |
|-----|------------------------------|------------------------------|-----------------------------|
|     | AC   | PAC | Q-statistic | Prob. | AC   | PAC | Q-statistic | Prob. | AC   | PAC | Q-statistic | Prob. |
| 1   | -0.168 | -0.168 | 0.5983 | 0.439 | 0.127 | 0.127 | 0.3738 | 0.541 | -0.033 | -0.033 | 0.0248 | 0.875 |
| 2   | 0.038 | 0.01  | 0.6304 | 0.73  | 0.004 | -0.012 | 0.3743 | 0.829 | 0.286 | 0.285 | 1.9394 | 0.379 |
| 3   | -0.044 | -0.037 | 0.6771 | 0.879 | 0.171 | 0.175 | 1.1293 | 0.77  | -0.238 | -0.242 | 3.3536 | 0.34  |
| 4   | -0.009 | -0.023 | 0.6789 | 0.954 | 0.259 | 0.225 | 2.9779 | 0.562 | -0.097 | -0.202 | 3.6057 | 0.462 |
| 5   | -0.198 | -0.208 | 1.7687 | 0.88  | -0.308 | -0.394 | 5.763  | 0.33  | 0.004 | 0.173 | 3.6061 | 0.607 |
Table 11  (Continued)

| Lag | Dependent variable: d(sca4) | Dependent variable: d(sra1) | Dependent variable: d(sra7) |
|-----|-----------------------------|------------------------------|-----------------------------|
|     | AC | PAC | Q-statistic | Prob. | AC | PAC | Q-statistic | Prob. | AC | PAC | Q-statistic | Prob. |
| 1   | -0.022 | -0.022 | 0.0109 | 0.917 | -0.034 | -0.034 | 0.0249 | 0.875 | -0.109 | -0.109 | 0.2637 | 0.608 |
| 2   | -0.036 | -0.037 | 0.0421 | 0.979 | -0.147 | -0.148 | 0.5104 | 0.775 | 0.081 | 0.07 | 0.4167 | 0.812 |
| 3   | 0.267 | 0.266 | 1.821 | 0.61 | -0.224 | -0.241 | 1.7165 | 0.633 | -0.043 | -0.027 | 0.4618 | 0.927 |
| 4   | -0.151 | -0.154 | 2.4276 | 0.658 | 0.172 | 0.135 | 2.4809 | 0.648 | -0.178 | -0.194 | 1.3069 | 0.86 |
| 5   | -0.11 | -0.1 | 2.7737 | 0.735 | -0.206 | -0.286 | 3.6588 | 0.6 | 0.008 | -0.026 | 1.3088 | 0.934 |

| Lag | Dependent variable: d(sca5) | Dependent variable: d(sra2) | Dependent variable: d(sra8HP) |
|-----|-----------------------------|------------------------------|-------------------------------|
|     | AC | PAC | Q-statistic | Prob. | AC | PAC | Q-statistic | Prob. | AC | PAC | Q-statistic | Prob. |
| 1   | 0.083 | 0.083 | 0.1544 | 0.694 | -0.05 | -0.05 | 0.0559 | 0.813 | -0.228 | -0.228 | 1.1477 | 0.284 |
| 2   | -0.177 | -0.186 | 0.8918 | 0.64 | -0.287 | -0.29 | 1.9901 | 0.37 | -0.085 | -0.145 | 1.3186 | 0.517 |
| 3   | -0.066 | -0.035 | 1.0011 | 0.801 | -0.03 | -0.069 | 2.012 | 0.57 | 0.282 | 0.245 | 3.3084 | 0.346 |
| 4   | -0.187 | -0.22 | 1.9314 | 0.748 | -0.192 | -0.311 | 2.997 | 0.558 | -0.224 | -0.128 | 4.6405 | 0.326 |
| 5   | 0.222 | 0.262 | 3.3306 | 0.649 | -0.182 | -0.313 | 3.9447 | 0.557 | 0.061 | 0.039 | 4.7479 | 0.447 |

| Lag | Dependent variable: d(sca4) | Dependent variable: d(sra3) | Dependent variable: d(sra8HPd) |
|-----|-----------------------------|------------------------------|-------------------------------|
|     | AC | PAC | Q-statistic | Prob. | AC | PAC | Q-statistic | Prob. | AC | PAC | Q-statistic | Prob. |
| 1   | -0.141 | -0.141 | 0.4389 | 0.508 | -0.024 | -0.024 | 0.0131 | 0.909 | -0.224 | -0.224 | 1.1139 | 0.291 |
| 2   | -0.159 | -0.182 | 1.0301 | 0.597 | -0.188 | -0.189 | 0.8438 | 0.656 | -0.194 | -0.257 | 1.9937 | 0.369 |
| 3   | -0.103 | -0.164 | 1.2972 | 0.73 | -0.394 | -0.419 | 4.709 | 0.194 | 0.145 | 0.037 | 2.5173 | 0.472 |
| 4   | 0.066 | -0.012 | 1.4131 | 0.842 | 0.051 | -0.05 | 4.7777 | 0.311 | 0.068 | 0.077 | 2.6402 | 0.62 |
| 5   | 0.149 | 0.122 | 2.0468 | 0.843 | 0.017 | -0.178 | 4.7854 | 0.443 | -0.23 | -0.17 | 4.1494 | 0.528 |
| Lag | Dependent variable: d(sca7) | Dependent variable: d(sra4) | Dependent variable: d(sra9) |
|-----|-----------------------------|-----------------------------|-----------------------------|
|     | AC  | PAC | Q-statistic | Prob. | AC  | PAC | Q-statistic | Prob. | AC  | PAC | Q-statistic | Prob. |
| 1   | 0.072 | 0.072 | 0.1057 | 0.745 | −0.001 | −0.001 | 4.00E-05 | 0.995 | −0.056 | −0.056 | 0.0733 | 0.787 |
| 2   | −0.102 | −0.108 | 0.3299 | 0.848 | 0.119 | 0.119 | 0.3466 | 0.841 | 0.161 | 0.158 | 0.7045 | 0.703 |
| 3   | −0.221 | −0.208 | 1.4564 | 0.692 | −0.005 | −0.004 | 0.3472 | 0.951 | −0.284 | −0.276 | 2.7994 | 0.424 |
| 4   | −0.312 | −0.312 | 3.8731 | 0.423 | −0.017 | −0.032 | 0.3555 | 0.986 | 0.37 | 0.367 | 6.5593 | 0.161 |
| 5   | −0.298 | −0.381 | 6.2633 | 0.281 | 0.141 | 0.144 | 0.9389 | 0.967 | −0.084 | −0.038 | 6.7672 | 0.239 |

| Lag | Dependent variable: d(sra10l) |
|-----|-------------------------------|
|     | AC  | PAC | Q-statistic | Prob. |
| 1   | −0.042 | −0.042 | 0.0377 | 0.846 |
| 2   | 0.015 | 0.013 | 0.0426 | 0.979 |
| 3   | −0.022 | −0.021 | 0.0547 | 0.997 |
| 4   | −0.268 | −0.27 | 1.899 | 0.754 |
| 5   | 0.455 | 0.467 | 7.6334 | 0.178 |
Table 12  ADF and PP unit root tests of residuals SyS1scr

| Null hypothesis:  | Null hypothesis:  | Null hypothesis:  | Null hypothesis:  |
|-------------------|-------------------|-------------------|-------------------|
|                   |                   |                   |                   |
| ressc4 has a unit root | ressc3 has a unit root | ressc2 has a unit root | ressc1 has a unit root |
| t-statistic       | t-statistic       | t-statistic       | t-statistic       |
| Prob.             | Prob.             | Prob.             | Prob.             |
|                   |                   |                   |                   |
| ADF, exogenous: none | ADF, exogenous: none | ADF, exogenous: none | ADF, exogenous: none |
|                  | t-statistic       | t-statistic       | t-statistic       |
|                  | t-statistic       | t-statistic       | t-statistic       |
|                  | Prob.             | Prob.             | Prob.             |
|                  |                   |                   |                   |

ADF, exogenous: constant

| Null hypothesis:  | Null hypothesis:  | Null hypothesis:  | Null hypothesis:  |
|-------------------|-------------------|-------------------|-------------------|
|                   |                   |                   |                   |
| ressc4 has a unit root | ressc3 has a unit root | ressc2 has a unit root | ressc1 has a unit root |
| t-statistic       | t-statistic       | t-statistic       | t-statistic       |
| Prob.             | Prob.             | Prob.             | Prob.             |
|                   |                   |                   |                   |
| ADF, exogenous: constant, linear trend | ADF, exogenous: constant, linear trend | ADF, exogenous: constant, linear trend | ADF, exogenous: constant, linear trend |
|                  | t-statistic       | t-statistic       | t-statistic       |
|                  | t-statistic       | t-statistic       | t-statistic       |
|                  | Prob.             | Prob.             | Prob.             |
|                  |                   |                   |                   |
| PP, exogenous: none | PP, exogenous: none | PP, exogenous: none | PP, exogenous: none |
|                  | t-statistic       | t-statistic       | t-statistic       |
|                  | t-statistic       | t-statistic       | t-statistic       |
|                  | Prob.             | Prob.             | Prob.             |
|                  |                   |                   |                   |
| PP, exogenous: constant | PP, exogenous: constant | PP, exogenous: constant | PP, exogenous: constant |
|                  | t-statistic       | t-statistic       | t-statistic       |
|                  | t-statistic       | t-statistic       | t-statistic       |
|                  | Prob.             | Prob.             | Prob.             |
|                  |                   |                   |                   |
| PP, exogenous: constant, linear trend | PP, exogenous: constant, linear trend | PP, exogenous: constant, linear trend | PP, exogenous: constant, linear trend |
|                  | t-statistic       | t-statistic       | t-statistic       |
|                  | t-statistic       | t-statistic       | t-statistic       |
|                  | Prob.             | Prob.             | Prob.             |
|                  |                   |                   |                   |
| Null hypothesis: resca9 has a unit root | Null hypothesis: resca10 has a unit root | Null hypothesis: resra1 has a unit root | Null hypothesis: resra2 has a unit root |
|----------------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|
| t-statistic | Prob. | t-statistic | Prob. | t-statistic | Prob. | t-statistic | Prob. |
| ADF, exogenous: none | $-3.789794$ | $0.0008$ | $-5.27384$ | $0$ | $-3.016457$ | $0.0049$ | $-4.043831$ | $0.0004$ |
| ADF, exogenous: constant | $-3.663534$ | $0.0155$ | $-5.162812$ | $0.0008$ | $-2.900826$ | $0.066$ | $-3.951321$ | $0.0083$ |
| ADF, exogenous: constant, linear trend | $-3.646379$ | $0.0559$ | $-5.140881$ | $0.0039$ | $-2.8125$ | $0.2119$ | $-3.97919$ | $0.0298$ |
| PP, exogenous: none | $-3.76958$ | $0.0009$ | $-7.353143$ | $0$ | $-2.908989$ | $0.0063$ | $-4.043831$ | $0.0004$ |
| PP, exogenous: constant | $-3.635529$ | $0.0164$ | $-7.09582$ | $0$ | $-2.790106$ | $0.0805$ | $-3.951321$ | $0.0083$ |
| PP, exogenous: constant, linear trend | $-3.557692$ | $0.0649$ | $-7.493081$ | $0$ | $-2.681021$ | $0.2547$ | $-3.973131$ | $0.0301$ |

| Null hypothesis: resra3 has a unit root | Null hypothesis: resra4 has a unit root | Null hypothesis: resra5HP has a unit root | Null hypothesis: resra5HPd has a unit root |
|----------------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|
| t-statistic | Prob. | t-statistic | Prob. | t-statistic | Prob. | t-statistic | Prob. |
| ADF, exogenous: none | $-3.46127$ | $0.017$ | $-5.532511$ | $0$ | $-3.222773$ | $0.0031$ | $-2.361507$ | $0.0218$ |
| ADF, exogenous: constant | $-3.361322$ | $0.027$ | $-5.373084$ | $0.0004$ | $-3.091733$ | $0.0465$ | $-2.123058$ | $0.2389$ |
| ADF, exogenous: constant, linear trend | $-3.142646$ | $0.1267$ | $-4.837124$ | $0.0061$ | $-2.932113$ | $0.1776$ | $-2.265232$ | $0.4268$ |
| PP, exogenous: none | $-3.46127$ | $0.017$ | $-5.913703$ | $0$ | $-1.834051$ | $0.0646$ | $-5.664019$ | $0$ |
| PP, exogenous: constant | $-3.361322$ | $0.027$ | $-5.70976$ | $0.0002$ | $-1.356726$ | $0.5795$ | $-5.853202$ | $0.0002$ |
| PP, exogenous: constant, linear trend | $-3.142646$ | $0.1267$ | $-9.865782$ | $0$ | $-1.714644$ | $0.7022$ | $-9.964217$ | $0$ |
Table 12  (Continued)

| Null hypothesis: | Null hypothesis: | Null hypothesis: | Null hypothesis: |
|------------------|------------------|------------------|------------------|
|                  | resra6 has a unit root | resra7 has a unit root | resra8HP has a unit root | resra8HPd has a unit root |
|                  | t-statistic | Prob. | t-statistic | Prob. | t-statistic | Prob. | t-statistic | Prob. |
| ADF, exogenous: none | −3.720831 | 0.0009 | −4.171027 | 0.0003 | −2.832449 | 0.0074 | −5.387255 | 0 |
| ADF, exogenous: constant | −3.612433 | 0.0164 | −3.94738 | 0.0089 | −3.102695 | 0.0481 | −5.243256 | 0.0006 |
| ADF, exogenous: constant, linear trend | −3.505032 | 0.0692 | −3.777624 | 0.0445 | −2.922023 | 0.1835 | −5.189448 | 0.0032 |
| PP, exogenous: none | −3.709671 | 0.0009 | −3.557824 | 0.0013 | −2.757837 | 0.0087 | −6.014966 | 0 |
| PP, exogenous: constant | −3.598596 | 0.0168 | −3.321521 | 0.0292 | −2.660895 | 0.0999 | −6.301019 | 0.0001 |
| PP, exogenous: constant, linear trend | −3.489806 | 0.071 | −2.902353 | 0.1844 | −2.489547 | 0.3283 | −8.353103 | 0 |

| Null hypothesis: | Null hypothesis: |
|------------------|------------------|
|                  | resra9 has a unit root | resra10l has a unit root |
|                  | t-statistic | Prob. | t-statistic | Prob. |
| ADF, exogenous: none | −2.725678 | 0.0093 | −6.80313 | 0 |
| ADF, exogenous: constant | −2.640708 | 0.1026 | −6.617948 | 0.0001 |
| ADF, exogenous: constant, linear trend | −2.683911 | 0.2527 | −6.352981 | 0.0005 |
| PP, exogenous: none | −2.732364 | 0.0091 | −6.767128 | 0 |
| PP, exogenous: constant | −2.648713 | 0.1012 | −6.586823 | 0.0001 |
| PP, exogenous: constant, linear trend | −2.715594 | 0.2416 | −6.352981 | 0.0005 |
analysis of the differences $\text{resra}_{ij} = a_{ij} - r_{aij}$ can be informative. Given the independence of these differences, the assumption that $\text{sca}_j$ and $\text{sra}_i$ include attractor points and that the derived $r_{aij}$ contain such compatible points becomes plausible since both $\text{sca}_i$ and $\text{sra}_i$ represent simple summations of the corresponding $a_{ij}$.

Consequently, we return to the BDS test. As in the previous application, the test was applied to both probabilities (normal and bootstrap) in three options related to the distance (fraction of pairs, standard deviations, and fraction of range) and in five dimensions (2, 3, 4, 5, and 6). For each $\text{resra}_{ij}$, 30 p-values were again computed (as before). The distribution of all 3000 p-values is described in Fig. 11. Only one fifth of the p-values do not exceed 0.05. This proportion falls to 8\% in the case of the bootstrap method, which is more relevant for relatively short series.

For this reason, as a general approximation, the serial independence of $\text{resra}_{ij}$ differences was assumed. Consequently, the probability of attractor points in the data for $a_{ij}$ cannot be neglected.

6. Further on, the attractor points will be estimated based on the following additional assumptions:

- It is admitted that in the proximity of an attractor point, the values of the respective technical coefficients are relatively stable. In other words, first- and higher-order differences tend to disappear.
- In terms of level, the value of the technical coefficient coincides or is close to that of the attractor point. The importance of the presence of observations in level (I(0) problem) in econometric formulae has already been outlined.
### Table 13 Algebraical attractor definitions

| Variables (y)          | Approximating formula          |
|------------------------|--------------------------------|
| sca1, sra2, sra4, sra9, log(sra10) | ay = a0/a1                     |
| sca8, sca10            | ay = (b0 + b2)/−b1             |
| sra2, sra3             | ay = c0/c1                     |
| sca5, sca6, sca9       | ay = (d0 + d4)/−d1             |
| sra8                   | ay = e0/e1                     |
| sca7, sra5             | ay = (f0 + f5)/−f1             |
| sra1, sra6             | ay = g0/g1                     |
| sca3                   | ay = h0/h1                     |
| sca4, sra7             | ay = (i0 + i3)/−i1 or = i0/i1 |

### Table 14 Attractor-points for the colsums and rowsums of technical coefficients

| Symbol | Estimation | Symbol | Estimation |
|--------|------------|--------|------------|
| asca1  | 0.488059   | asra1  | 0.508254   |
| asca2  | 0.633969   | asra2  | 0.546414   |
| asca3  | 0.904387   | asra3  | 0.674086   |
| asca4  | 0.603476   | asra4  | 0.389116   |
| asca5  | 0.566348   | asra5  | 0.467036   |
| asca6  | 0.5619     | asra6  | 0.564482   |
| asca7  | 0.722865   | asra7  | 1.337777   |
| asca8  | 0.536487   | asra8  | 0.130711   |
| asca9  | 0.438797   | asra9  | 0.37335    |
| asca10 | 0.47579    | asra10 | 0.687186   |

- The attractor points are conceived at long-run levels. For large values of t, it is admitted that $t^{-1} \to 0$ and $t/(t + 1) \to 1$.

The scheme containing the main econometric relationships will be adapted to these assumptions, the result being the algebraical expressions of attractors in the 9 types of specifications (Table 13) included in SyS1scr. Their symbols are given the prefix a: asca\textsubscript{j} and asra\textsubscript{i}.

Table 14 presents the approximated attractors for colsums (asca\textsubscript{j}) and rowsums (asra\textsubscript{i}) of the I-O coefficients. These estimations were included as column–row restrictions in a new RAS application concerning all a\textsubscript{ij}. This algorithm was applied on a matrix compounded by the average levels of the respective statistical coefficients (for the entire interval 1989–2009). Table 15 presents the so-obtained attractor points (aaij).

### 4 Conclusions

The analysis of Romanian I-O tables (based on surveys for 21 consecutive years) reveals new evidence in favour of the statement that the technical coefficients are volatile (illustrated by the relatively high standard deviation of corresponding series).
Table 15  Attractor-points for individual technical coefficients (aa$_{ij}$)

| j  | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    |
|----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| aa1j | 0.233951 | 0.001173 | 0.000136 | 0.232187 | 0.034418 | 0.000132 | 0.000947 | 0.000367 | 0.000277 | 0.004665 |
| aa2j | 0.001076 | 0.173019 | 0.270478 | 0.001162 | 0.00058 | 0.006661 | 0.073396 | 0.015125 | 0.002156 | 0.002762 |
| aa3j | 0.024686 | 0.090712 | 0.288858 | 0.022381 | 0.030654 | 0.04102 | 0.095837 | 0.023173 | 0.033597 | 0.023168 |
| aa4j | 0.053107 | 0.0026 | 0.001616 | 0.213718 | 0.009814 | 0.002945 | 0.007421 | 0.004082 | 0.005101 | 0.088714 |
| aa5j | 0.008545 | 0.011228 | 0.003287 | 0.017918 | 0.290144 | 0.019729 | 0.021376 | 0.025626 | 0.009881 | 0.059303 |
| aa6j | 0.017634 | 0.084122 | 0.043601 | 0.011139 | 0.022303 | 0.176451 | 0.037253 | 0.062144 | 0.078011 | 0.031824 |
| aa7j | 0.086517 | 0.086553 | 0.165247 | 0.028473 | 0.076022 | 0.194198 | 0.371607 | 0.173607 | 0.094814 | 0.060737 |
| aa8j | 0.00491 | 0.000865 | 0.014924 | 0.002182 | 0.002516 | 0.003279 | 0.00486 | 0.07097 | 0.007305 | 0.0149 |
| aa9j | 0.013468 | 0.067402 | 0.026501 | 0.014494 | 0.020011 | 0.02745 | 0.028172 | 0.02357 | 0.120064 | 0.032218 |
| aa10j | 0.023246 | 0.085211 | 0.051111 | 0.03394 | 0.055662 | 0.066024 | 0.05111 | 0.114896 | 0.068388 | 0.137147 |
This affects both determinations of I-O coefficients, either in volume (\(c_{aij}\)) or in value terms (\(a_{ij}\)); the first is referred to as real volatility and the second as nominal volatility. Their dynamic pattern is similar, as confirmed by three measures: (a) the vectorial angle between the series \(a_{ij}\) and \(c_{aij}\), (b) the Galtung–Pearson correlation (also a cosine of the vectorial angle but between their deviations against the mean) and (c) the binary synchronisation degree.

To verify whether or not the I-O coefficients are serially correlated, the BDS procedure was used as a test covering a large variety of possible deviations from independence in the time data. Again, both forms of technical coefficients were studied. Generally, the serial correlation could not be statistically rejected. It is important to mention that this conclusion resulted from a relatively extended database.

Due to these two circumstances—high volatility and serial correlation—the possible presence of attractors in the technical coefficients series was taken into consideration. Such points would be flexibly interpreted not as unchangeable levels but rather as historical (contextually determined) phenomena. This approach is similar to the manner in which other authors regarded the natural rate of unemployment, for instance, as a weak attractor. Consequently, the evolution of I-O coefficients was conceived as an auto-regressive adaptive process, the differences between the actual coefficients and their long-run levels being influenced by the precedent deviations. Since the available series for sectoral coefficients are, as a rule, non-stationary, more aggregate indicators were employed in econometric analysis (column and row sums of I-O coefficients). The RAS technique was used to transform these into sectoral estimations.

The paper’s approach can be considered as an attempt to conciliate the assumption of I-O coefficients’ stability with their undisputable volatility.

Further research could improve on the econometric estimations through structural specifications of the technical coefficients, including their stable co-movements. Thus, more complex econometric specifications must be cautiously adopted, but based on a solid economic motivation.

The possible presence of attractors in the series of I-O coefficients also opens a large research space. A deeper investigation of their determinants—technologies, inter-industry linkages, institutional factors—would be interesting from both the theoretical and the applicative perspective. In addition, it would be relevant to clarify the temporal stability of the attractors themselves.

**Competing Interests**

The author declares that he has no competing interests.

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**Statistical and Econometric Appendix**
### Table 16 Column-sums of the technical coefficients at current prices

| Year | \(sca_1\) | \(sca_2\) | \(sca_3\) | \(sca_4\) | \(sca_5\) | \(sca_6\) | \(sca_7\) | \(sca_8\) | \(sca_9\) | \(sca_{10}\) |
|------|------|------|------|------|------|------|------|------|------|------|
| 1989 | 0.491558 | 0.569253 | 0.889023 | 0.76225 | 0.552646 | 0.650026 | 0.812164 | 0.712277 | 0.420045 | 0.496334 |
| 1990 | 0.387324 | 0.668055 | 0.956937 | 0.729538 | 0.585299 | 0.622568 | 0.799226 | 0.633274 | 0.466569 | 0.454735 |
| 1991 | 0.494798 | 0.663253 | 0.820943 | 0.750352 | 0.675304 | 0.700584 | 0.75585 | 0.622815 | 0.454685 | 0.378095 |
| 1992 | 0.498327 | 0.676749 | 0.779253 | 0.737931 | 0.668211 | 0.700656 | 0.742198 | 0.584504 | 0.404153 | 0.346181 |
| 1993 | 0.475942 | 0.633793 | 0.722954 | 0.676025 | 0.623013 | 0.659749 | 0.711613 | 0.569026 | 0.395378 | 0.343785 |
| 1994 | 0.447545 | 0.625294 | 0.656678 | 0.648452 | 0.561198 | 0.593076 | 0.693557 | 0.513575 | 0.362277 | 0.334192 |
| 1995 | 0.431615 | 0.736073 | 0.637111 | 0.657541 | 0.58757 | 0.587836 | 0.740255 | 0.568219 | 0.423969 | 0.283543 |
| 1996 | 0.448299 | 0.889495 | 0.705545 | 0.662567 | 0.620109 | 0.639375 | 0.745313 | 0.574133 | 0.434749 | 0.325155 |
| 1997 | 0.448678 | 0.885471 | 0.718332 | 0.718407 | 0.614082 | 0.643057 | 0.756277 | 0.568766 | 0.434086 | 0.383843 |
| 1998 | 0.500438 | 0.73034 | 0.711868 | 0.671709 | 0.589266 | 0.618621 | 0.750819 | 0.552626 | 0.412593 | 0.373144 |
| 1999 | 0.451623 | 0.649843 | 0.710166 | 0.689681 | 0.626521 | 0.645794 | 0.730459 | 0.521393 | 0.410677 | 0.373031 |
| 2000 | 0.471773 | 0.620211 | 0.728855 | 0.675673 | 0.578638 | 0.610767 | 0.712465 | 0.551344 | 0.410928 | 0.376375 |
| 2001 | 0.464331 | 0.557372 | 0.767713 | 0.626716 | 0.568639 | 0.589786 | 0.727921 | 0.562682 | 0.412289 | 0.420057 |
| 2002 | 0.483088 | 0.550141 | 0.765831 | 0.629274 | 0.569244 | 0.582466 | 0.711277 | 0.545703 | 0.412843 | 0.415685 |
| 2003 | 0.46985 | 0.636448 | 0.790705 | 0.651569 | 0.586742 | 0.612382 | 0.755768 | 0.558792 | 0.424581 | 0.423453 |
| 2004 | 0.470463 | 0.65786 | 0.793915 | 0.654237 | 0.590792 | 0.605497 | 0.748681 | 0.554347 | 0.434705 | 0.423932 |
| 2005 | 0.511133 | 0.660908 | 0.793131 | 0.621407 | 0.583903 | 0.581869 | 0.73793 | 0.544117 | 0.431047 | 0.416438 |
| 2006 | 0.505062 | 0.665331 | 0.793829 | 0.623597 | 0.585979 | 0.585482 | 0.735709 | 0.543761 | 0.433134 | 0.428825 |
| 2007 | 0.547584 | 0.664387 | 0.789971 | 0.623635 | 0.579907 | 0.57569 | 0.716971 | 0.53191 | 0.420637 | 0.425441 |
| 2008 | 0.534281 | 0.641298 | 0.796951 | 0.626553 | 0.582379 | 0.579771 | 0.721889 | 0.533723 | 0.425995 | 0.439046 |
| 2009 | 0.521289 | 0.624123 | 0.795017 | 0.624762 | 0.592213 | 0.57092 | 0.704817 | 0.541346 | 0.440151 | 0.445557 |
Table 17  Row-sums of the technical coefficients at current prices

| Year | sra1  | sra2  | sra3  | sra4  | sra5  | sra6  | sra7  | sra8  | sra9  | sra10 |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1989 | 0.879487 | 0.715536 | 0.460816 | 0.424076 | 0.458559 | 1.204335 | 1.512107 | 0.130762 | 0.464525 | 0.105374 |
| 1990 | 0.719968 | 0.681193 | 0.595892 | 0.420332 | 0.509075 | 1.137719 | 1.616523 | 0.126245 | 0.382477 | 0.114103 |
| 1991 | 0.799707 | 0.519268 | 0.740962 | 0.30728 | 0.55112 | 1.009835 | 1.719619 | 0.122188 | 0.430851 | 0.115852 |
| 1992 | 0.758225 | 0.559776 | 0.802719 | 0.323097 | 0.549017 | 0.850436 | 1.632821 | 0.053936 | 0.447255 | 0.160882 |
| 1993 | 0.828402 | 0.483196 | 0.668033 | 0.307312 | 0.476423 | 0.608609 | 1.417821 | 0.066092 | 0.700265 | 0.253325 |
| 1994 | 0.7714 | 0.513863 | 0.655478 | 0.365699 | 0.488487 | 0.548466 | 1.37154 | 0.071654 | 0.453217 | 0.19604 |
| 1995 | 0.720338 | 0.52918 | 0.629171 | 0.344625 | 0.538629 | 0.64714 | 1.444648 | 0.135043 | 0.388398 | 0.276562 |
| 1996 | 0.639786 | 0.589832 | 0.583761 | 0.443051 | 0.593274 | 0.77149 | 1.494947 | 0.121243 | 0.492754 | 0.3146 |
| 1997 | 0.650862 | 0.624606 | 0.690994 | 0.457173 | 0.549141 | 0.631484 | 1.607715 | 0.100695 | 0.416869 | 0.441459 |
| 1998 | 0.701866 | 0.470438 | 0.650553 | 0.375155 | 0.545836 | 0.701163 | 1.429193 | 0.120339 | 0.450406 | 0.464676 |
| 1999 | 0.625048 | 0.294633 | 0.851485 | 0.378145 | 0.535579 | 0.65026 | 1.283071 | 0.102068 | 0.546984 | 0.541914 |
| 2000 | 0.589872 | 0.455738 | 0.705737 | 0.421593 | 0.504906 | 0.606695 | 1.440411 | 0.099778 | 0.298352 | 0.613946 |
| 2001 | 0.560844 | 0.515316 | 0.696012 | 0.423083 | 0.510963 | 0.516993 | 1.462513 | 0.114338 | 0.280583 | 0.616862 |
| 2002 | 0.550552 | 0.472552 | 0.796213 | 0.424217 | 0.501515 | 0.471378 | 1.415838 | 0.123366 | 0.281333 | 0.628588 |
| 2003 | 0.604588 | 0.565419 | 0.779686 | 0.417632 | 0.475566 | 0.521081 | 1.341116 | 0.167739 | 0.326985 | 0.710478 |
| 2004 | 0.628928 | 0.584544 | 0.695776 | 0.419551 | 0.467175 | 0.534748 | 1.390866 | 0.161495 | 0.34003 | 0.711316 |
| 2005 | 0.594292 | 0.563607 | 0.625771 | 0.390167 | 0.449022 | 0.562245 | 1.447483 | 0.1435 | 0.355017 | 0.750782 |
| 2006 | 0.574519 | 0.63664 | 0.584961 | 0.392571 | 0.425354 | 0.574501 | 1.388618 | 0.196368 | 0.353318 | 0.773859 |
| 2007 | 0.542797 | 0.630615 | 0.579161 | 0.414989 | 0.408277 | 0.577103 | 1.402135 | 0.185372 | 0.369498 | 0.766186 |
| 2008 | 0.610861 | 0.557296 | 0.590074 | 0.399415 | 0.389158 | 0.569906 | 1.423817 | 0.192557 | 0.376025 | 0.772777 |
| 2009 | 0.603559 | 0.541821 | 0.735107 | 0.381838 | 0.384324 | 0.589331 | 1.234232 | 0.244792 | 0.419811 | 0.725381 |
Table 18  System SYS1scr: Specification

| Expression                                                                 |
|---------------------------------------------------------------------------|
| \(d(sca_1) = c(1) + c(2) * sca_1(-1) + c(501) * d90\)                   |
| \(d(sca_2) = c(3) + c(4) * sca_2(-1) + c(5) * d(sca_2(-1)) + c(502) * d95 + c(503) * d96\) |
| \(d(sca_3) = c(6) + c(7) * sca_3(-3) + c(8)/t + c(504) * d96\)          |
| \(d(sca_4) = c(9) + c(10) * sca_4(-2) + c(11) * d(sca_4, 2) + c(12) * t/(t + 1) + c(505) * d99\) |
| \(d(sca_5) = c(13) + c(14) * sca_5(-1) + c(15) * d(sca_5(-1)) + c(16) * t/(t + 1)\) |
| \(d(sca_6) = c(17) + c(18) * sca_6(-1) + c(19) * d(sca_6(-1)) + c(20) * t/(t + 1)\) |
| \(d(sca_7) = c(21) + c(22) * sca_7(-1) + c(23) * d(sca_7(-1)) + c(24) * d(sca_7(-2)) + c(25) * d(sca_7(-3)) + c(26) * t/(t + 1)\) |
| \(d(sca_8) = c(27) + c(28) * sca_8(-1) + c(29) * d(sca_8, 2) + c(506) * d96\) |
| \(d(sca_9) = c(30) + c(31) * sca_9(-1) + c(32) * d(sca_9(-2)) + c(33) * t/(t + 1) + c(507) * d96\) |
| \(d(sca_{10}) = c(34) + c(35) * t/(t + 1) + c(36) * sca_{10}(-1) + c(508) * d90 + c(509) * d95\) |
| \(d(sra_1) = c(37) + c(38) * sra_1(-1) + c(39) * d(sra_1(-2)) + c(40)/t + c(510) * d98\) |
| \(d(sra_2) = c(41) + c(42) * sra_2(-1) + c(43) * d(sra_2, 2) + c(511) * d99\) |
| \(d(sra_3) = c(44) + c(45) * sra_3(-2) + c(46) * d(sra_3(-1)) + c(512) * d99\) |
| \(d(sra_4) = c(47) + c(48) * sra_4(-1) + c(513) * d96 + c(514) * d91\) |
| \(d(sra_{5HP}) = c(49) + c(50) * sra_{5HP}(-1) + c(51) * d(sra_{5HP}(-1))\) |
| \(d(sra_{5HPd}) = c(52) + c(53) * sra_{5HPd}(-1) + c(54) * d(sra_{5HPd}(-1)) + c(515) * d93 + c(516) * d96\) |
| \(d(sra_6) = c(54) + c(55) * sra_6(-1) + c(56) * d(sra_6, 2) + c(517) * d93\) |
| \(d(sra_7) = c(57) + c(58) * sra_7(-2) + c(59) * d(sra_7, 2) + c(60)/t\) |
| \(d(sra_{8HP}) = c(61) + c(62) * sra_{8HP}(-1) + c(63) * d(sra_{8HP}, 2) + c(518) * d93 + c(519) * d94\) |
| \(d(sra_{8HPd}) = c(64) * d(sra_{8HPd}, 2) + c(520) * d92 + c(521) * d95\) |
| \(d(sra_9) = c(65) + c(66) * sra_9(-1) + c(522) * d93 + c(523) * d99\) |
| \(d(sra_{10l}) = c(67) + c(68) * sra_{10l}(-3) + c(524) * d94\) |
| Coefficient | Std. error | t-statistic | Prob.  | Coefficient | Std. error | t-statistic | Prob.  |
|-------------|------------|-------------|--------|-------------|------------|-------------|--------|
| c(1)        | 0.283078   | 0.08625     | 3.282047 | 0.001142962 | c(38)      | −0.81444    | 0.205237 | −3.96828 | 8.92E-05 |
| c(2)        | −0.58001   | 0.18071     | −3.20961 | 0.001462231 | c(39)      | 0.33183     | 0.156979 | 2.113855 | 0.035291504 |
| c(501)      | −0.10221   | 0.029494    | −3.46533 | 0.000609096 | c(40)      | 1.076357    | 0.330764 | 3.254154 | 0.001257343 |
| c(3)        | 0.278431   | 0.06312     | 4.411333 | 1.40E-05    | c(510)     | 0.086243    | 0.036361 | 2.371851 | 0.018283202 |
| c(4)        | −0.43919   | 0.0929      | −4.72754 | 3.39E-06    | c(41)      | 0.23365     | 0.103312 | 2.261582 | 0.02438575 |
| c(5)        | 0.408362   | 0.119747    | 3.410206 | 0.00073125  | c(42)      | −0.42761    | 0.188762 | −2.26331 | 0.024153256 |
| c(502)      | 0.11044    | 0.033033    | 3.34364  | 0.000924647 | c(43)      | 0.285218    | 0.122418 | 2.329865 | 0.020427225 |
| c(503)      | 0.153027   | 0.035167    | 4.351465 | 1.81E-05    | c(511)     | −0.20212    | 0.050267 | −4.02093 | 7.22E-05 |
| c(6)        | 0.125699   | 0.044001    | 2.85674  | 0.004556706 | c(44)      | 0.521483    | 0.141276 | 3.667871 | 0.000285804 |
| c(7)        | −0.13899   | 0.062557    | −2.22178 | 0.026988791 | c(45)      | −0.77361    | 0.208359 | −3.71289 | 0.00024117 |
| c(8)        | −0.24993   | 0.084743    | −2.9493  | 0.003416579 | c(46)      | −0.50663    | 0.210056 | −2.41191 | 0.016424787 |
| c(504)      | 0.074459   | 0.017457    | 4.265162 | 2.62E-05    | c(512)     | 0.193523    | 0.068301 | 2.833381 | 0.004894547 |
| c(9)        | 0.924228   | 0.160358    | 5.76353  | 1.92E-08    | c(47)      | 0.13412     | 0.057677 | 2.325375 | 0.020669034 |
| c(10)       | −0.75929   | 0.119904    | −6.33248 | 8.05E-10    | c(48)      | −0.34468    | 0.145689 | −2.36584 | 0.018577283 |
| c(11)       | 0.47183    | 0.061448    | 7.67855  | 1.92E-13    | c(513)     | 0.083091    | 0.028105 | 2.956484 | 0.003340097 |
| c(12)       | −0.46602   | 0.093994    | −4.95792 | 1.15E-06    | c(514)     | −0.10229    | 0.027463 | −3.72469 | 0.000230612 |
| c(505)      | 0.03589    | 0.013722    | 2.615495 | 0.009326674 | c(49)      | 0.013136    | 0.001677 | 7.831778 | 6.93E-14 |
| c(13)       | 1.064914   | 0.140304    | 7.590058 | 3.43E-13    | c(50)      | −0.02813    | 0.003245 | −8.66814 | 2.14E-16 |
| c(14)       | −1.18973   | 0.15666     | −7.59436 | 3.34E-13    | c(51)      | 1.08189     | 0.015285 | 70.78026 | 3.87E-199 |
| c(15)       | 0.454757   | 0.129331    | 3.516215 | 0.000500165 | c(52)      | −0.83309    | 0.158971 | −5.24052 | 2.89E-07 |
| c(16)       | −0.39111   | 0.079436    | −4.92362 | 1.36E-06    | c(53)      | 0.320171    | 0.130101 | 2.460931 | 0.014378755 |
| c(17)       | 1.216451   | 0.186703    | 6.515444 | 2.77E-10    | c(515)     | −0.05209    | 0.013328 | −3.90808 | 0.000113298 |
| c(18)       | −1.08361   | 0.17362     | −6.24131 | 1.36E-09    | c(516)     | 0.042189    | 0.013558 | 3.111817 | 0.002024883 |

Table 19  SYS1scr estimated by different methods—sample 1990–2009: OLS—ordinary least squares
| Coefficient | Std. error | t-statistic | Prob. | Coefficient | Std. error | t-statistic | Prob. |
|-------------|------------|-------------|-------|-------------|------------|-------------|-------|
| c(19)       | 0.465948   | 0.153538    | 3.034749 | 0.002602261 | c(54)      | 0.135167    | 0.056727 | 2.382743 | 0.017760431 |
| c(20)       | -0.60757   | 0.105767    | -5.74438 | 2.13E-08    | c(55)      | -0.23945    | 0.084606 | -2.83021 | 0.004942134 |
| c(21)       | 1.5781     | 0.285591    | 5.525739 | 6.75E-08    | c(56)      | 0.284088    | 0.132169 | 2.149434 | 0.032340176 |
| c(22)       | -1.82179   | 0.303507    | -6.00245 | 5.21E-09    | c(57)      | -0.14994    | 0.059384 | -2.52487 | 0.012051054 |
| c(23)       | 0.765847   | 0.205822    | 3.720919 | 0.00023936  | c(58)      | 1.052576    | 0.121187 | 8.685559 | 1.89E-16   |
| c(24)       | 0.756215   | 0.17858     | 4.234588 | 2.99E-05    | c(59)      | -0.78681    | 0.087866 | -8.95465 | 2.72E-17   |
| c(25)       | 0.559842   | 0.182826    | 3.062164 | 0.002381463 | c(60)      | 0.522016    | 0.054793 | 9.527016 | 3.95E-19   |
| c(26)       | -0.26119   | 0.113264    | -2.30606 | 0.021738264 | c(61)      | -0.02272    | 0.002453 | -9.26173 | 2.86E-18   |
| c(27)       | 0.20165    | 0.054576    | 3.69482  | 0.000258233 | c(62)      | 0.17378     | 0.012884 | 13.48847 | 3.24E-33   |
| c(28)       | -0.37587   | 0.097205    | -3.86677 | 0.000133287 | c(63)      | 0.761811    | 1.251823 | 6.085614 | 3.27E-09   |
| c(29)       | 0.414938   | 0.077282    | 5.369165 | 1.51E-07    | c(64)      | -0.00564    | 0.001664 | -3.38751 | 0.00079222 |
| c(30)       | 0.226448   | 0.075907    | 2.983219 | 0.003068868 | c(65)      | -0.05021    | 0.001714 | -3.04001 | 0.002558513 |
| c(31)       | -1.23202   | 0.16691     | -7.38132 | 1.33E-12    | c(66)      | 0.394639    | 0.079062 | 4.991487 | 9.80E-07   |
| c(32)       | 0.557367   | 0.138947    | 4.011371 | 7.50E-05    | c(67)      | -0.03994    | 0.014916 | -2.67737 | 0.007798128 |
| c(33)       | 0.314156   | 0.058156    | 5.401991 | 1.28E-07    | c(68)      | 0.39854     | 0.014704 | 2.710374 | 0.007078646 |
| c(34)       | 0.044864   | 0.011907    | 3.767881 | 0.000195553 | c(69)      | 0.274047    | 0.055718 | 4.918437 | 1.39E-06   |
| c(35)       | -0.15911   | 0.055598    | -2.86172 | 0.004487515 | c(70)      | -0.73402    | 0.134082 | -5.47443 | 8.81E-08   |
| c(36)       | 0.371868   | 0.058992    | 6.303751 | 9.50E-10    | c(71)      | 0.307258    | 0.059092 | 5.199688 | 3.54E-07   |
| c(37)       | 0.041543   | 0.022503    | 4.067977 | 5.96E-05    | c(72)      | 0.153138    | 0.059135 | 2.589621 | 0.010041828 |
| c(38)       | -0.06748   | 0.014801    | -4.55935 | 7.28E-06    | c(73)      | -0.20561    | 0.024533 | -8.38109 | 1.62E-15   |
| c(39)       | 0.413941   | 0.106503    | 3.886657 | 0.00012328  | c(74)      | -0.62241    | 0.073826 | -8.43065 | 1.15E-15   |
| Coefficient | Std. error | t-statistic | Prob.  | Coefficient | Std. error | t-statistic | Prob.  |
|-------------|------------|-------------|--------|-------------|------------|-------------|--------|
| c(1)        | 0.283078   | 0.079519    | 3.55988 | 0.000426566 | c(38)      | −0.81444    | 0.174418 | −4.66946 | 4.43E-06 |
| c(2)        | −0.58001   | 0.166606    | −3.48131 | 0.000567383 | c(39)      | 0.33183     | 0.133406 | 2.487366 | 0.013371939 |
| c(501)      | −0.10221   | 0.027192    | −3.75867 | 0.000202576 | c(40)      | 1.076357    | 0.281095 | 3.829153 | 0.000154358 |
| c(3)        | 0.278431   | 0.054182    | 5.138814 | 4.79E-07    | c(510)     | 0.086243    | 0.030901 | 2.79095 | 0.00556695 |
| c(4)        | −0.43919   | 0.079745    | −5.50742 | 7.43E-08    | c(41)      | 0.23365     | 0.091796 | 2.545326 | 0.011380659 |
| c(5)        | 0.408362   | 0.10279    | 3.97277 | 8.76E-05    | c(42)      | −0.42761    | 0.167719 | −2.54953 | 0.011247182 |
| c(502)      | 0.11044    | 0.028355    | 3.894901 | 0.000119343 | c(43)      | 0.285218    | 0.108771 | 2.622176 | 0.00914958 |
| c(503)      | 0.153027   | 0.030187    | 5.069303 | 6.73E-07    | c(511)     | −0.20212    | 0.044664 | −4.5254 | 8.47E-06 |
| c(6)        | 0.125699   | 0.038805    | 3.239239 | 0.001322776 | c(44)      | 0.521483    | 0.126327 | 4.128053 | 4.66E-05 |
| c(7)        | −0.13899   | 0.05517    | −2.51926 | 0.012240942 | c(45)      | −0.77361    | 0.185132 | −4.17872 | 3.77E-05 |
| c(8)        | −0.24993   | 0.074736    | −3.3442 | 0.000921969 | c(46)      | −0.50663    | 0.186639 | −2.71451 | 0.006992757 |
| c(504)      | 0.074459   | 0.015396    | 4.836239 | 2.05E-06    | c(512)     | 0.193523    | 0.060687 | 3.188865 | 0.001567833 |
| c(9)        | 0.924228   | 0.13765    | 6.714309 | 8.48E-11    | c(47)      | 0.13412     | 0.051588 | 2.599849 | 0.009753476 |
| c(10)       | −0.75929   | 0.102925    | −7.37712 | 1.37E-12    | c(48)      | −0.34468    | 0.130308 | −2.64509 | 0.00856481 |
| c(11)       | 0.47183    | 0.052746    | 8.945246 | 2.91E-17    | c(513)     | 0.083091    | 0.025138 | 3.30545 | 0.001054529 |
| c(12)       | −0.46602   | 0.080684    | −5.7758 | 1.80E-08    | c(514)     | −0.10229    | 0.024564 | −4.16433 | 4.01E-05 |
| c(505)      | 0.03589    | 0.011779    | 3.04696 | 0.002501691 | c(49)      | 0.013136    | 0.001539 | 8.534482 | 5.52E-16 |
| c(13)       | 1.064914   | 0.124663    | 8.542329 | 5.22E-16    | c(50)      | −0.02813    | 0.002978 | −9.44589 | 7.25E-19 |
| c(14)       | −1.18973   | 0.139196    | −8.54717 | 5.05E-16    | c(51)      | 1.08189     | 0.014027 | 77.131 | 1.49E-210 |
| c(15)       | 0.454757   | 0.114914    | 3.957369 | 9.32E-05    | c(52)      | −0.83309    | 0.14125 | −5.89801 | 9.25E-09 |
| c(16)       | −0.39111   | 0.070581    | −5.54135 | 6.22E-08    | c(53)      | 0.320171    | 0.115598 | 2.769686 | 0.005934489 |
| c(17)       | 1.216451   | 0.16589    | 7.33289 | 1.82E-12    | c(515)     | −0.05209    | 0.011843 | −4.3984 | 1.48E-05 |
| c(18)       | −1.08361   | 0.154265    | −7.02436 | 1.27E-11    | c(516)     | 0.042189    | 0.012046 | 3.502234 | 0.000526139 |
Table 20 (Continued)

| Coefficient | Std. error | t-statistic | Prob.  | Coefficient | Std. error | t-statistic | Prob.  |
|------------|------------|-------------|--------|-------------|------------|-------------|--------|
| c(19)      | 0.465948   | 0.136422    | 3.415497 | 0.000717678 | c(54)      | 0.135167    | 0.050404 | 2.681688   | 0.007700416 |
| c(20)      | -0.60757   | 0.093977    | -6.46509 | 3.72E-10    | c(55)      | -0.23945    | 0.075174 | -3.18529   | 0.001586701 |
| c(21)      | 1.5781     | 0.229729    | 6.869395 | 3.31E-11    | c(56)      | 0.284088    | 0.117435 | 2.419109   | 0.016109025 |
| c(22)      | -1.82179   | 0.244141    | -7.46203 | 7.91E-13    | c(517)     | -0.14994    | 0.052764 | -2.84165   | 0.004772473 |
| c(23)      | 0.765847   | 0.165563    | 4.62571  | 5.40E-06    | c(57)      | 1.052576    | 0.107678 | 9.775252   | 6.02E-20   |
| c(24)      | 0.756215   | 0.14365     | 5.264284 | 2.57E-07    | c(58)      | -0.78681    | 0.078071 | -10.0781   | 5.87E-21   |
| c(25)      | 0.559842   | 0.147065    | 3.806769 | 0.000168351 | c(59)      | 0.522016    | 0.048685 | 10.7223    | 3.70E-23   |
| c(26)      | -0.26119   | 0.091109    | -2.86681 | 0.004417774 | c(60)      | 0.773993    | 0.11227  | 6.894012   | 2.84E-11   |
| c(27)      | 0.20165    | 0.048492    | 4.158383 | 4.11E-05    | c(61)      | -0.02272    | 0.002105 | -10.7896   | 2.16E-23   |
| c(28)      | -0.37587   | 0.086369    | -4.35191 | 1.81E-05    | c(62)      | 0.17378     | 0.011059 | 15.71359   | 9.33E-42   |
| c(29)      | 0.414938   | 0.068666    | 6.042796 | 4.16E-09    | c(63)      | 7.618111    | 1.074559 | 7.089526   | 8.47E-12   |
| c(30)      | 0.038061   | 0.011624    | 3.274303 | 0.001173709 | c(518)     | -0.00564    | 0.001428 | -3.94633   | 9.73E-05   |
| c(31)      | 0.226448   | 0.064509    | 3.510344 | 0.000510922 | c(519)     | -0.00521    | 0.001471 | -3.5415    | 0.000456213 |
| c(32)      | -1.23202   | 0.141846    | -8.68557 | 1.89E-16    | c(64)      | 0.394639    | 0.072553 | 5.439346   | 1.06E-07   |
| c(33)      | 0.557367   | 0.118082    | 4.720168 | 3.51E-06    | c(520)     | -0.03994    | 0.013688 | -2.9176    | 0.003773847 |
| c(34)      | 0.314156   | 0.049423    | 6.356506 | 7.00E-10    | c(521)     | 0.039854    | 0.013493 | 2.953561   | 0.003371041 |
| c(36)      | -0.44718   | 0.065753    | -6.80082 | 5.02E-11    | c(523)     | 0.153138    | 0.052892 | 2.895285   | 0.00404538 |
| c(37)      | 0.091543   | 0.019489    | 4.697295 | 3.90E-06    | c(67)      | -0.07714    | 0.026239 | -2.9397    | 0.003521415 |
| c(38)      | -0.06748   | 0.012818    | -5.26469 | 2.56E-07    | c(68)      | -0.20561    | 0.022396 | -9.18103   | 5.19E-18   |
| c(39)      | 0.413941   | 0.09051     | 4.573417 | 6.84E-06    | c(524)     | -0.62241    | 0.067394 | -9.23532   | 3.48E-18   |
| Coefficient | Std. error | t-statistic | Prob.   | Coefficient | Std. error | t-statistic | Prob.   |
|-------------|------------|-------------|---------|-------------|------------|-------------|---------|
| c(1)        | 0.234957   | 0.058079    | 4.045498| 6.53E-05    | c(38)      | -0.84056    | 0.100483| -8.36515 | 1.81E-15 |
| c(2)        | -0.48089   | 0.121424    | -3.9604 | 9.20E-05    | c(39)      | 0.34597     | 0.079175| 4.369712| 1.68E-05 |
| c(501)      | -0.11051   | 0.01443     | -7.65865| 2.19E-13    | c(40)      | 1.137276    | 0.173371| 6.559794| 2.13E-10 |
| c(3)        | 0.272854   | 0.020134    | 13.55169| 1.87E-33    | c(510)     | 0.09166     | 0.016681| 5.494938| 7.92E-08 |
| c(4)        | -0.42622   | 0.028895    | -14.751 | 4.96E-38    | c(41)      | 0.249617    | 0.026854| 9.295474| 2.23E-18 |
| c(5)        | 0.400249   | 0.039501    | 10.13262| 3.85E-21    | c(42)      | -0.44738    | 0.046709| -9.57791| 2.69E-19 |
| c(502)      | 0.120347   | 0.01254     | 9.597298| 2.32E-19    | c(43)      | 0.270023    | 0.025781| 10.4738 | 2.66E-22 |
| c(503)      | 0.147105   | 0.013128    | 11.2054 | 7.52E-25    | c(511)     | -0.20361    | 0.012093| -16.8361| 3.88E-46 |
| c(6)        | 0.115054   | 0.014094    | 8.163217| 7.33E-15    | c(44)      | 0.548312    | 0.045754| 11.9838 | 1.22E-27 |
| c(7)        | -0.12727   | 0.019723    | -6.45284| 4.00E-10    | c(45)      | -0.81821    | 0.065265| -12.5368| 1.15E-29 |
| c(8)        | -0.24232   | 0.034329    | -7.05859| 1.03E-11    | c(46)      | -0.54969    | 0.065482| -8.39457| 1.47E-15 |
| c(504)      | 0.082137   | 0.006536    | 12.56645| 8.97E-30    | c(512)     | 0.194547    | 0.029549| 6.583848| 1.85E-10 |
| c(9)        | 0.943513   | 0.043286    | 21.79729| 1.75E-65    | c(47)      | 0.15916     | 0.025087| 6.344446| 7.51E-10 |
| c(10)       | -0.75699   | 0.029589    | -25.5831| 9.35E-80    | c(48)      | -0.40294    | 0.062287| -6.46904| 3.64E-10 |
| c(11)       | 0.475233   | 0.013396    | 35.47534| 1.29E-113   | c(513)     | 0.090953    | 0.014434| 6.301505| 9.62E-10 |
| c(12)       | -0.48929   | 0.029803    | -16.4175| 1.68E-44    | c(514)     | -0.08508    | 0.012256| -6.94239| 2.11E-11 |
| c(505)      | 0.036983   | 0.002789    | 13.25975| 2.35E-32    | c(49)      | 0.01349     | 0.000625| 21.57141| 1.30E-64 |
| c(13)       | 1.06234    | 0.053497    | 19.85786| 5.74E-58    | c(50)      | -0.02875    | 0.001192| -24.1101| 2.82E-74 |
| c(14)       | -1.21682   | 0.053302    | -22.8289| 1.97E-69    | c(51)      | 1.085785    | 0.008216| 132.1608| 6.73E-28 |
| c(15)       | 0.466725   | 0.044263    | 10.54438| 1.52E-22    | c(52)      | -0.86156    | 0.060809| -14.1682| 8.52E-36 |
| c(16)       | -0.37179   | 0.042773    | -8.6921 | 1.80E-16    | c(53)      | 0.328044    | 0.049865| 6.578703| 1.91E-10 |
| c(17)       | 1.251569   | 0.07414     | 16.88106| 2.59E-46    | c(515)     | -0.05817    | 0.005475| -10.624 | 8.09E-23 |
| c(18)       | -1.13099   | 0.066292    | -17.0608| 5.13E-47    | c(516)     | 0.037513    | 0.005639| 6.65296 | 1.22E-10 |
| c(19) | 0.461616 | 0.053557 | 8.619101 | 3.03E-16 | c(54) | 0.140982 | 0.026324 | 5.355615 | 1.62E-07 |
| c(20) | −0.61549  | 0.050982 | −12.0727 | 5.80E-28 | c(55) | −0.24846 | 0.035189 | −7.0609  | 1.01E-11 |
| c(21) | 1.591889  | 0.090008 | 17.68004 | 1.82E-49 | c(56) | 0.280768 | 0.038032 | 7.382508 | 1.32E-12 |
| c(22) | −1.83248  | 0.092471 | −19.8168 | 8.30E-58 | c(517)| −0.17261 | 0.023242 | −7.42684 | 9.93E-13 |
| c(23) | 0.774811  | 0.067097 | 11.54767 | 4.56E-26 | c(57) | 0.98605  | 0.044398 | 22.2092  | 4.59E-67 |
| c(24) | 0.739849  | 0.054287 | 13.62841 | 9.59E-34 | c(58) | −0.74137 | 0.031644 | −23.4283 | 1.05E-71 |
| c(25) | 0.558427  | 0.053313 | 10.47448 | 2.64E-22 | c(59) | 0.523095 | 0.017136 | 30.52647 | 2.46E-97 |
| c(26) | −0.268    | 0.04471  | −5.99429 | 5.45E-09 | c(60) | 0.773597 | 0.058144 | 13.30473 | 1.59E-32 |
| c(27) | 0.197595  | 0.020551 | 9.614966 | 2.03E-19 | c(61) | −0.0229  | 0.001283 | −17.8516 | 4.08E-50 |
| c(28) | −0.36951  | 0.035719 | −10.3451 | 7.32E-22 | c(62) | 0.175333 | 0.00685  | 25.59751 | 8.27E-80 |
| c(29) | 0.400592  | 0.018888 | 21.20883 | 3.25E-63 | c(63) | 7.671487 | 0.548712 | 13.98089 | 4.41E-35 |
| c(30) | 0.038445  | 0.002467 | 9.099607 | 1.82E-17 | c(518) | −0.0055  | 0.000613 | −8.96842 | 2.46E-17 |
| c(31) | −1.18993  | 0.056699 | −20.9867 | 2.35E-62 | c(64) | 0.430947 | 0.030779 | 14.0012  | 3.69E-35 |
| c(32) | 0.545298  | 0.040457 | 13.47857 | 3.53E-33 | c(520) | −0.03993 | 0.006948 | −5.7465  | 2.10E-08 |
| c(33) | 0.308919  | 0.028288 | 10.92042 | 7.55E-24 | c(521) | 0.037305 | 0.00608  | 6.135315 | 2.48E-09 |
| c(34) | 0.046084  | 0.004433 | 10.39612 | 4.90E-22 | c(65) | 0.244369 | 0.023271 | 10.50116 | 2.14E-22 |
| c(35) | −0.13306  | 0.025963 | −5.12513 | 5.12E-07 | c(66) | −0.67082 | 0.050755 | −13.2168 | 3.41E-32 |
| c(36) | 0.351948  | 0.02466 | 14.27219 | 3.41E-36 | c(522) | 0.304342 | 0.029036 | 10.48162 | 2.50E-22 |
| c(37) | 0.425266  | 0.052871 | 8.043437 | 1.66E-14 | c(524) | −0.64568 | 0.026648 | −24.2303 | 9.97E-75 |
Table 22  SYS1scr estimated by different methods—sample 1990–2009: GLM—generalized linear models with bootstrap

| Coefficient | Std. error | z     | Prob. | Coefficient | Std. error | z     | Prob. |
|-------------|------------|-------|-------|-------------|------------|-------|-------|
| c(1)        | 0.283078   | 0.082689 | 3.42  | 0.001       | c(38)      | −0.81444 | 0.188264 | −4.33 | 0     |
| c(2)        | −0.58001   | 0.170839 | −3.4  | 0.001       | c(39)      | 0.33183  | 0.159535 | 2.08  | 0.038 |
| c(501)      | −0.10221   | 0.004737 | −21.58| 0           | c(40)      | 1.076356 | 0.332231 | 3.24  | 0.001 |
| c(3)        | 0.278431   | 0.101581 | 2.74  | 0.006       | c(510)     | 0.086243 | 0.011943 | 7.22  | 0     |
| c(4)        | −0.43919   | 0.153461 | −2.86 | 0.004       | c(41)      | 0.23365  | 0.088917 | 2.63  | 0.009 |
| c(5)        | 0.408363   | 0.140692 | 2.9   | 0.004       | c(42)      | −0.42761 | 0.163947 | −2.61 | 0.009 |
| c(502)      | 0.11044    | 0.006218 | 17.76 | 0           | c(43)      | 0.285218 | 0.091688 | 3.11  | 0.002 |
| c(503)      | 0.153027   | 0.014458 | 10.58 | 0           | c(511)     | −0.20212 | 0.015286 | −13.22| 0     |
| c(6)        | 0.125699   | 0.041312 | 3.04  | 0.002       | c(44)      | 0.521483 | 0.108545 | 4.8   | 0     |
| c(7)        | −0.13899   | 0.050457 | −2.75 | 0.006       | c(45)      | −0.77361 | 0.158828 | −4.87 | 0     |
| c(8)        | −0.24993   | 0.085994 | −2.91 | 0.004       | c(46)      | −0.50663 | 0.175199 | −2.89 | 0.004 |
| c(504)      | 0.074459   | 0.005317 | 14    | 0           | c(512)     | 0.193523 | 0.011274 | 17.17 | 0     |
| c(9)        | 0.924228   | 0.094083 | 9.82  | 0           | c(47)      | 0.13412  | 0.047279 | 2.84  | 0.005 |
| c(10)       | −0.75929   | 0.067526 | −11.24| 0           | c(48)      | −0.34468 | 0.118808 | −2.9  | 0.004 |
| c(11)       | 0.47183    | 0.047361 | 9.96  | 0           | c(513)     | 0.083091 | 0.007286 | 11.4  | 0     |
| c(12)       | −0.46602   | 0.056969 | −8.18 | 0           | c(514)     | −0.10229 | 0.004784 | −21.38| 0     |
| c(505)      | 0.03589    | 0.004272 | 8.4   | 0           | c(49)      | 0.013136 | 0.001949 | 6.74  | 0     |
| c(13)       | 1.064914   | 0.167703 | 6.35  | 0           | c(50)      | −0.02813 | 0.003768 | −7.46 | 0     |
| c(14)       | −1.18973   | 0.193828 | −6.14 | 0           | c(51)      | 1.08189  | 0.01169  | 92.55 | 0     |
| c(15)       | 0.454757   | 0.165187 | 2.75  | 0.006       | c(52)      | −0.83309 | 0.153003 | −5.44 | 0     |
| c(16)       | −0.39111   | 0.087032 | −4.49 | 0           | c(53)      | 0.320171 | 0.137497 | 2.33  | 0.02  |
| c(17)       | 1.216451   | 0.209223 | 5.81  | 0           | c(515)     | −0.05209 | 0.005145 | −10.12| 0     |
| c(18)       | −1.08361   | 0.17854  | −6.07 | 0           | c(516)     | 0.042189 | 0.005872 | 7.18  | 0     |
| Coefficient | Std. error | z   | Prob. | Coefficient | Std. error | z   | Prob. |
|------------|------------|-----|-------|------------|------------|-----|-------|
| c(19)      | 0.465948   | 0.172046  | 2.71  | 0.007      | c(54)      | 0.135167 | 0.065899 | 2.05  | 0.04 |
| c(20)      | -0.60757   | 0.12657   | -4.8  | 0          | c(55)      | -0.23945  | 0.111845 | -2.14  | 0.032|
| c(21)      | 1.5781     | 0.291682  | 5.41  | 0          | c(56)      | 0.284088  | 0.142332 | 2      | 0.046|
| c(22)      | -1.82179   | 0.352457  | -5.17 | 0          | c(57)      | -0.14994  | 0.029437 | -5.09  | 0    |
| c(23)      | 0.765847   | 0.237994  | 3.22  | 0.001      | c(58)      | 1.052575  | 0.100791 | 10.44  | 0    |
| c(24)      | 0.756215   | 0.238152  | 3.18  | 0.001      | c(59)      | -0.78681  | 0.075003 | -10.49  | 0    |
| c(25)      | 0.559842   | 0.191824  | 2.92  | 0.004      | c(60)      | 0.522016  | 0.060821 | 8.58   | 0    |
| c(26)      | -0.26119   | 0.109698  | -2.38 | 0.017      | c(61)      | 0.773993  | 0.15599  | 4.96   | 0    |
| c(27)      | 0.20165    | 0.037095  | 5.44  | 0          | c(62)      | -0.02272  | 0.001404 | -16.18  | 0    |
| c(28)      | -0.37587   | 0.06611   | -5.69 | 0          | c(63)      | 0.173781  | 0.007403 | 23.47  | 0    |
| c(29)      | 0.414938   | 0.064205  | 6.46  | 0          | c(64)      | 7.618141  | 0.782133 | 9.74   | 0    |
| c(30)      | 0.038061   | 0.004809  | 7.91  | 0          | c(65)      | -0.00564  | 0.000399 | -14.12  | 0    |
| c(31)      | 0.226448   | 0.115659  | 1.96  | 0.05       | c(66)      | 0.000521  | 0.000485 | -10.75  | 0    |
| c(32)      | -1.23202   | 0.246907  | -4.99 | 0          | c(67)      | 0.394639  | 0.049193 | 8.02   | 0    |
| c(33)      | 0.557367   | 0.151548  | 3.68  | 0          | c(68)      | -0.03994  | 0.003189 | -12.52  | 0    |
| c(34)      | 0.314156   | 0.064189  | 4.89  | 0          | c(69)      | 0.039854  | 0.002782 | 14.32  | 0    |
| c(35)      | 0.044864   | 0.006176  | 7.26  | 0          | c(70)      | 0.274047  | 0.036869 | 7.43   | 0    |
| c(36)      | -0.15911   | 0.032982  | -4.82 | 0          | c(71)      | -0.73402  | 0.096623 | -7.6   | 0    |
| c(37)      | 0.371868   | 0.0525    | 7.08  | 0          | c(72)      | 0.307258  | 0.009443 | 32.54  | 0    |
| c(507)     | 0.44718    | 0.072451  | -6.17 | 0          | c(73)      | 0.153138  | 0.009668 | 15.84  | 0    |
| c(508)     | -0.041543  | 0.018952  | 4.83  | 0          | c(74)      | -0.07714  | 0.01713  | -4.5   | 0    |
| c(67)      | -0.06748   | 0.004226  | -15.97 | 0         | c(68)      | -0.20561  | 0.019253 | -10.68  | 0    |
| c(38)      | 0.413941   | 0.095647  | 4.33  | 0          | c(524)     | -0.62241  | 0.030516 | -20.4  | 0    |
### Table 23 Comparative estimation output OLS–SUR

**Equation:** \( d(sca_1) = c(1) + c(2) \times sca_1(-1) + c(501) \times d90 \)

|                | OLS          | SUR          |
|----------------|--------------|--------------|
| R-squared      | 0.592041     | R-squared    | 0.582578     |
| Adjusted R-squared | 0.544045   | Adjusted R-squared | 0.533469    |
| S.E. of regression | 0.028614   | S.E. of regression | 0.028944    |
| Durbin–Watson stat. | 1.538095   | Durbin–Watson stat. | 1.721237    |

|                | Mean dependent var. | Mean dependent var. |
|----------------|---------------------|---------------------|
| OLS            | 0.001486537         | 0.001486537         |
| SUR            |                     |                     |
| S.D. dependent var. | 0.04237619     | S.D. dependent var. | 0.04237619 |
| Sum squared resid. | 0.013919204    | Sum squared resid. | 0.014242074|

**Equation:** \( d(sca_2) = c(3) + c(4) \times sca_2(-1) + c(5) \times d(sca_2(-1)) + c(502) \times d95 + c(503) \times d96 \)

|                | OLS          | SUR          |
|----------------|--------------|--------------|
| R-squared      | 0.827101     | R-squared    | 0.822768     |
| Adjusted R-squared | 0.777702   | Adjusted R-squared | 0.77213     |
| S.E. of regression | 0.03183    | S.E. of regression | 0.032227    |
| Durbin–Watson stat. | 2.754131   | Durbin–Watson stat. | 2.693471    |

|                | Mean dependent var. | Mean dependent var. |
|----------------|---------------------|---------------------|
| OLS            | −0.00231224         | −0.00231224         |
| SUR            |                     |                     |
| S.D. dependent var. | 0.067510188     | S.D. dependent var. | 0.067510188|
| Sum squared resid. | 0.014184143    | Sum squared resid. | 0.014539665|

**Equation:** \( d(sca_3) = c(6) + c(7) \times sca_3(-3) + c(8)/t + c(504) \times d96 \)

|                | OLS          | SUR          |
|----------------|--------------|--------------|
| R-squared      | 0.778591     | R-squared    | 0.773913     |
| Adjusted R-squared | 0.731147   | Adjusted R-squared | 0.725466    |
| S.E. of regression | 0.016444    | S.E. of regression | 0.016616    |
| Durbin–Watson stat. | 2.002707   | Durbin–Watson stat. | 1.987606    |

|                | Mean dependent var. | Mean dependent var. |
|----------------|---------------------|---------------------|
| OLS            | −0.00144036         | −0.00144036         |
| SUR            |                     |                     |
| S.D. dependent var. | 0.031713173     | S.D. dependent var. | 0.031713173|
| Sum squared resid. | 0.003785497    | Sum squared resid. | 0.003865477|
Table 23 (Continued)

| Equation: d(sca₄) = c(9) + c(10) * sca₄₋₋ + c(11) * d(sca₄, 2) + c(12) * t/(t + 1) + c(505) * d₉₆ |
|---------------------------------------------------------------|
| OLS | SUR |
| R-squared | 0.893072 | Mean dependent var. | −0.00551455 | R-squared | 0.890453 | Mean dependent var. | −0.00551455 |
| Adjusted R-squared | 0.862522 | S.D. dependent var. | 0.028411694 | Adjusted R-squared | 0.859154 | S.D. dependent var. | 0.028411694 |
| S.E. of regression | 0.010555 | Sum squared resid. | 0.001553663 | S.E. of regression | 0.010663 | Sum squared resid. | 0.00159172 |
| Durbin–Watson stat. | 1.833085 | Durbin–Watson stat. | 1.813972 |

| Equation: d(sca₅) = c(13) + c(14) * sca₅₋₋ + c(15) * d(sca₅₋₋) + c(16) * t/(t + 1) |
|---------------------------------------------------------------|
| OLS | SUR |
| R-squared | 0.805431 | Mean dependent var. | 0.000363901 | R-squared | 0.801683 | Mean dependent var. | 0.000363901 |
| Adjusted R-squared | 0.766517 | S.D. dependent var. | 0.033923317 | Adjusted R-squared | 0.76202 | S.D. dependent var. | 0.033923317 |
| S.E. of regression | 0.016392 | Sum squared resid. | 0.004030354 | S.E. of regression | 0.016549 | Sum squared resid. | 0.004107978 |
| Durbin–Watson stat. | 2.597269 | Durbin–Watson stat. | 2.536249 |

| Equation: d(sca₆) = c(17) + c(18) * sca₆₋₋ + c(19) * d(sca₆₋₋) + c(20) * t/(t + 1) |
|---------------------------------------------------------------|
| OLS | SUR |
| R-squared | 0.741118 | Mean dependent var. | −0.00271833 | R-squared | 0.737032 | Mean dependent var. | −0.00271833 |
| Adjusted R-squared | 0.689341 | S.D. dependent var. | 0.03293319 | Adjusted R-squared | 0.68438 | S.D. dependent var. | 0.03293319 |
| S.E. of regression | 0.018356 | Sum squared resid. | 0.005054087 | S.E. of regression | 0.0185 | Sum squared resid. | 0.005133851 |
| Durbin–Watson stat. | 1.930535 | Durbin–Watson stat. | 1.811626 |
Table 23 (Continued)

Equation: \( d(sca_7) = c(21) + c(22) \times sca_7(-1) + c(23) \times d(sca_7(-1)) + c(24) \times d(sca_7(-2)) + c(25) \times d(sca_7(-3)) + c(26) \times t/(t + 1) \)

|                | OLS                      | SUR                      |
|----------------|--------------------------|--------------------------|
| R-squared      | 0.776545                 | Mean dependent var.      | \(-0.00219888\)          |
| Adjusted R-squared | 0.674974               | S.D. dependent var.      | 0.021803938              |
| S.E. of regression | 0.012431               | Sum squared resid.       | 0.001699731              |
| Durbin–Watson stat. | 2.45839               | Durbin–Watson stat.      | 2.449675                 |

Equation: \( d(sca_8) = c(27) + c(28) \times sca_8(-1) + c(29) \times d(sca_8 - 2) + c(506) \times d96 \)

|                | OLS                      | SUR                      |
|----------------|--------------------------|--------------------------|
| R-squared      | 0.79341                  | Mean dependent var.      | \(-0.00483833\)          |
| Adjusted R-squared | 0.752092               | S.D. dependent var.      | 0.024203015              |
| S.E. of regression | 0.012051               | Sum squared resid.       | 0.002178319              |
| Durbin–Watson stat. | 1.725176               | Durbin–Watson stat.      | 1.776138                 |

Equation: \( d(sca_9) = c(30) + c(31) \times sca_9(-1) + c(32) \times d(sca_9(-2)) + c(33) \times t/(t + 1) + c(507) \times d96 \)

|                | OLS                      | SUR                      |
|----------------|--------------------------|--------------------------|
| R-squared      | 0.846468                 | Mean dependent var.      | \(-0.00080741\)          |
| Adjusted R-squared | 0.799227               | S.D. dependent var.      | 0.022579243              |
| S.E. of regression | 0.010117               | Sum squared resid.       | 0.001330662              |
| Durbin–Watson stat. | 1.832536               | Durbin–Watson stat.      | 1.928251                 |
### Table 23 (Continued)

| Equation: d(sca10) = c(34) + c(35) * t/(t + 1) + c(36) * sca10(-1) + c(508) * d90 + c(509) * d95 |
|---------------------------------------------------------------|
| **OLS** | **SUR** |
| R-squared | 0.849872 | Mean dependent var. | −0.00253882 | R-squared | 0.846468 | Mean dependent var. | −0.00253882 |
| Adjusted R-squared | 0.808698 | S.D. dependent var. | 0.031535026 | Adjusted R-squared | 0.805526 | S.D. dependent var. | 0.031535026 |
| S.E. of regression | 0.013793 | Sum squared resid. | 0.002853624 | S.E. of regression | 0.013907 | Sum squared resid. | 0.002900946 |
| Durbin–Watson stat. | 2.4873 | | | Durbin–Watson stat. | 2.432552 | |

| Equation: d(sra1) = c(37) + c(38) * sra1(-1) + c(39) * d(sra1(-2)) + c(40)/t + c(510) * d98 |
|---------------------------------------------------------------|
| **OLS** | **SUR** |
| R-squared | 0.611242 | Mean dependent var. | −0.01089713 | R-squared | 0.609433 | Mean dependent var. | −0.01089713 |
| Adjusted R-squared | 0.491625 | S.D. dependent var. | 0.047563903 | Adjusted R-squared | 0.489258 | S.D. dependent var. | 0.047563903 |
| S.E. of regression | 0.033913 | Sum squared resid. | 0.014951435 | S.E. of regression | 0.033992 | Sum squared resid. | 0.015021033 |
| Durbin–Watson stat. | 1.439341 | | | Durbin–Watson stat. | 1.431766 | |

| Equation: d(sra2) = c(41) + c(42) * sra2(-1) + c(43) * d(sra2, 2) + c(511) * d99 |
|---------------------------------------------------------------|
| **OLS** | **SUR** |
| R-squared | 0.777682 | Mean dependent var. | −0.00733534 | R-squared | 0.773894 | Mean dependent var. | −0.00733534 |
| Adjusted R-squared | 0.733218 | S.D. dependent var. | 0.089810856 | Adjusted R-squared | 0.728673 | S.D. dependent var. | 0.089810856 |
| S.E. of regression | 0.046388 | Sum squared resid. | 0.032277867 | S.E. of regression | 0.046782 | Sum squared resid. | 0.032827865 |
| Durbin–Watson stat. | 1.66777 | | | Durbin–Watson stat. | 1.64911 | |
## Table 23 (Continued)

Equation: \( \text{d}(\text{sra}_3) = c(44) + c(45) \times \text{sra}_3(-2) + c(46) \times \text{d}(\text{sra}_3(-1)) + c(512) \times \text{d}99 \)

|                | OLS                          | SUR                          |
|----------------|------------------------------|------------------------------|
| R-squared      | 0.604261                     | R-squared                    |
|                |                               | 0.601432                     | Mean dependent var. 0.007327141 |
| Adjusted R-squared | 0.525113                  | Adjusted R-squared          |
|                |                               | 0.521718                     | S.D. dependent var. 0.095697545 |
| S.E. of regression | 0.065947                   | S.E. of regression          |
|                |                               | 0.066182                     | Sum squared resid. 0.065701731  |
| Durbin–Watson stat.          | 1.611126                   | Durbin–Watson stat.         |
|                |                               | 1.521897                     |

Equation: \( \text{d}(\text{sra}_4) = c(47) + c(48) \times \text{sra}_4(-1) + c(513) \times \text{d}96 + c(514) \times \text{d}91 \)

|                | OLS                          | SUR                          |
|----------------|------------------------------|------------------------------|
| R-squared      | 0.701614                     | R-squared                    |
|                |                               | 0.683711                     | Mean dependent var. −0.00211187 |
| Adjusted R-squared | 0.645667                  | Adjusted R-squared          |
|                |                               | 0.624407                     | S.D. dependent var. 0.044451546 |
| S.E. of regression | 0.02646                    | S.E. of regression          |
|                |                               | 0.027242                     | Sum squared resid. 0.011874394  |
| Durbin–Watson stat.          | 2.497302                   | Durbin–Watson stat.         |
|                |                               | 2.320523                     |

Equation: \( \text{d}(\text{sra}_5\text{HP}) = c(49) + c(50) \times \text{sra}_5\text{HP}(-1) + c(51) \times \text{d}(\text{sra}_5\text{HP}(-1)) \)

|                | OLS                          | SUR                          |
|----------------|------------------------------|------------------------------|
| R-squared      | 0.998586                     | R-squared                    |
|                |                               | 0.998573                     | Mean dependent var. −0.00657374 |
| Adjusted R-squared | 0.998409                  | Adjusted R-squared          |
|                |                               | 0.998394                     | S.D. dependent var. 0.00887352  |
| S.E. of regression | 0.000354                   | S.E. of regression          |
|                |                               | 0.000356                     | Sum squared resid. 2.02E-06     |
| Durbin–Watson stat.          | 0.584091                   | Durbin–Watson stat.         |
|                |                               | 0.585266                     |
### Table 23 (Continued)

Equation: \( d(\text{sra}_5\text{HPd}) = c(52) \times \text{sra}_5\text{HPd}(-1) + c(53) \times d(\text{sra}_5\text{HPd}(-1)) + c(515) \times d93 + c(516) \times d96 \)

|                  | OLS           | SUR           |
|------------------|---------------|---------------|
| R-squared        | 0.852908      | R-squared     | 0.848174      |
| Adjusted R-squared | 0.82349      | Adjusted R-squared | 0.817809      |
| S.E. of regression | 0.012319     | S.E. of regression | 0.012515      |
| Durbin–Watson stat. | 1.956297    | Durbin–Watson stat. | 1.905226      |
| Mean dependent var. | 7.88E-06    | Mean dependent var. | 7.88E-06      |
| S.D. dependent var. | 0.02932112   | S.D. dependent var. | 0.02932112    |
| Sum squared resid. | 0.0027626    | Sum squared resid. | 0.002349518   |

Equation: \( d(\text{sra}_6) = c(54) + c(55) \times \text{sra}_6(-1) + c(56) \times d(\text{sra}_6, 2) + c(517) \times d93 \)

|                  | OLS           | SUR           |
|------------------|---------------|---------------|
| R-squared        | 0.705175      | R-squared     | 0.701184      |
| Adjusted R-squared | 0.64621      | Adjusted R-squared | 0.64142      |
| S.E. of regression | 0.055427      | S.E. of regression | 0.055801      |
| Durbin–Watson stat. | 1.764954    | Durbin–Watson stat. | 1.907709      |
| Mean dependent var. | −0.02886253  | Mean dependent var. | −0.02886253  |
| S.D. dependent var. | 0.093185537  | S.D. dependent var. | 0.093185537  |
| Sum squared resid. | 0.046082199  | Sum squared resid. | 0.046706118  |

Equation: \( d(\text{sra}_7) = c(57) + c(58) \times \text{sra}_7(-2) + c(59) \times d(\text{sra}_7, 2) + c(517) \times d93 \)

|                  | OLS           | SUR           |
|------------------|---------------|---------------|
| R-squared        | 0.920327      | R-squared     | 0.918205      |
| Adjusted R-squared | 0.904393     | Adjusted R-squared | 0.901847      |
| S.E. of regression | 0.033509      | S.E. of regression | 0.033952      |
| Durbin–Watson stat. | 1.736261    | Durbin–Watson stat. | 1.701985      |
| Mean dependent var. | −0.02012059  | Mean dependent var. | −0.02012059  |
| S.D. dependent var. | 0.108371317  | S.D. dependent var. | 0.108371317  |
| Sum squared resid. | 0.016842702  | Sum squared resid. | 0.017291216  |
Table 23  (Continued)

| Equation: \( d(sra_8HP) = c(61) + c(62) \cdot sra_8HP(-1) + c(63) \cdot d(sra_8HP, 2) + c(518) \cdot d93 + c(519) \cdot d94 \) |
|---------------------------------|---------------------------------|
| OLS                             | SUR                             |
| R-squared                       | 0.941453                        | R-squared                       | 0.941163                        |
| Mean dependent var.             | 0.005926559                     | Mean dependent var.             | 0.005926559                     |
| Adjusted R-squared              | 0.924725                        | Adjusted R-squared              | 0.924352                        |
| S.D. dependent var.             | 0.005647312                     | S.D. dependent var.             | 0.005647312                     |
| S.E. of regression              | 0.001549                        | S.E. of regression              | 0.001553                        |
| Sum squared resid.              | 3.36E-05                        | Sum squared resid.              | 3.38E-05                        |
| Durbin–Watson stat.             | 1.30744                         | Durbin–Watson stat.             | 1.274754                        |

| Equation: \( d(sra_8HPd) = c(64) \cdot d(sra_8HPd, 2) + c(520) \cdot d92 + c(521) \cdot d95 \) |
|---------------------------------|---------------------------------|
| OLS                             | SUR                             |
| R-squared                       | 0.806027                        | R-squared                       | 0.803115                        |
| Mean dependent var.             | 0.000312728                     | Mean dependent var.             | 0.000312728                     |
| Adjusted R-squared              | 0.78178                         | Adjusted R-squared              | 0.778504                        |
| S.D. dependent var.             | 0.029986054                     | S.D. dependent var.             | 0.029986054                     |
| S.E. of regression              | 0.014008                        | S.E. of regression              | 0.014112                        |
| Sum squared resid.              | 0.00313945                      | Sum squared resid.              | 0.003186578                     |
| Durbin–Watson stat.             | 2.438696                        | Durbin–Watson stat.             | 2.477959                        |
Table 23  (Continued)

Equation: \( d(sra_9) = c(65) + c(66) \times sra_9(-1) + c(522) \times d93 + c(523) \times d99 \)

|                      | OLS                      | SUR                      |
|----------------------|--------------------------|--------------------------|
| R-squared            | 0.774555                 | 0.769816                 |
| Adjusted R-squared   | 0.732284                 | 0.726657                 |
| S.E. of regression   | 0.057227                 | 0.057826                 |
| Durbin–Watson stat. | 1.192039                 | 1.327546                 |

Mean dependent var.  | –0.00223569              | Mean dependent var.      | –0.00223569              |
S.D. dependent var.  | 0.110603027              | S.D. dependent var.      | 0.110603027              |
Sum squared resid.   | 0.052399624              | Sum squared resid.       | 0.053501025              |
Durbin–Watson stat.  |                         |                          |                          |

Equation: \( d(sra_{10l}) = c(67) + c(68) \times sra_{10l}(-3) + c(524) \times d94 \)

|                      | OLS                      | SUR                      |
|----------------------|--------------------------|--------------------------|
| R-squared            | 0.871203                 | 0.867635                 |
| Adjusted R-squared   | 0.85403                  | 0.849986                 |
| S.E. of regression   | 0.065978                 | 0.066886                 |
| Durbin–Watson stat. | 2.849506                 | 2.662251                 |

Mean dependent var.  | 0.10191042               | Mean dependent var.      | 0.10191042               |
S.D. dependent var.  | 0.172691047              | S.D. dependent var.      | 0.172691047              |
Sum squared resid.   | 0.065297402              | Sum squared resid.       | 0.067106068              |
Durbin–Watson stat.  |                         |                          |                          |
Table 24  Generalized method of moments—time series (HAC): Kernel: Bartlett, bandwidth: Variable Newey–West (5), no prewhitening

| Equation | Description |
|----------|-------------|
| SYS1scaG | d(sca1) = c(1) + c(2) * sca1(-1) @ sca1(-1) |
|          | d(sca2) = c(3) + c(4) * sca2(-1) + c(5) * d(sca2(-1)) @ sca2(-1) d(sca2(-1)) |
|          | d(sca3) = c(6) + c(7) * sca3(-3) + c(8)/t @ sca10(-3) 1/t |
|          | d(sca4) = c(9) + c(10) * sca4(-2) + c(11) * d(sca4, 2) + c(12) * t/(t+1) @ sca6(-2) d(sca4, 2) t/(t+1) |
|          | d(sca5) = c(13) + c(14) * sca5(-1) + c(15) * d(sca5(-1)) + c(16) * t/(t+1) @ sca6(-1) d(sca5(-1)) t/(t+1) |
|          | d(sca6) = c(17) + c(18) * sca6(-1) + c(19) * d(sca6(-1)) + c(20) * t/(t+1) @ sca4(-1) d(sca6(-1)) t/(t+1) |
|          | d(sca7) = c(21) + c(22) * sca7(-1) + c(23) * d(sca7(-1)) + c(24) * d(sca7(-2)) + c(25) * d(sca7(-3)) + c(26) * t/(t+1) @ sca8(-1) d(sca7(-1)) d(sca7(-2)) d(sca7(-3)) t/(t+1) |
|          | d(sca8) = c(27) + c(28) * sca8(-1) + c(29) * d(sca8, 2) @ sca7(-1) d(sca8, 2) |
|          | d(sca9) = c(30) + c(31) * sca9(-1) + c(32) * d(sca9(-2)) + c(33) * t/(t+1) @ sca9(-1) d(sca9(-2)) t/(t+1) |
|          | d(sca10) = c(34) + c(35) * t/(t+1) + c(36) * sca10(-1) @ t/(t+1) sca3(-1) |
| SYS1sraG | d(sra1) = c(37) + c(38) * sra1(-1) + c(39) * d(sra1(-2)) + c(40)/t @ sra10(-1) d(sra1(-2)) 1/t |
|          | d(sra2) = c(41) + c(42) * sra2(-1) + c(43) * d(sra2, 2) @ sra3(-1) d(sra2, 2) |
|          | d(sra3) = c(44) + c(45) * sra3(-2) + c(46) * d(sra3(-1)) @ sra2(-2) d(sra3(-1)) |
|          | d(sra4) = c(47) + c(48) * sra4(-1) @ sra4(-1) |
|          | d(sra5HP) = c(49) + c(50) * sra5HP(-1) + c(51) * d(sra5HP(-1)) @ sra8HP(-1) d(sra5HP(-1)) |
|          | d(sra5HPd) = c(52) * sra5HPd(-1) + c(53) * d(sra5HPd(-1)) @ sra5HPd(-1) d(sra5(-1)) |
|          | d(sra6) = c(54) + c(55) * sra6(-1) + c(56) * d(sra6, 2) @ sra10(-1) d(sra6, 2) |
|          | d(sra7) = c(57) + c(58) * sra7(-2) + c(59) * d(sra7, 2) + c(60)/t @ sra7(-2) d(sra7, 2) 1/t |
|          | d(sra9) = c(65) + c(66) * sra9(-1) @ sra9(-1) |
|          | d(sra10l) = c(67) + c(68) * sra10l(-3) @ sra10(-3) |
| SYS1sra8G | d(sra8HP) = c(61) + c(62) * sra8HP(-1) + c(63) * d(sra8HP, 2) @ sca1(-1) d(sra1) |
|          | d(sra8HPd) = c(64) * d(sra8HPd, 2) @ d(sra8) |
| Estimation | Coefficient | Std. error | t-statistic | Prob. |
|------------|-------------|------------|-------------|-------|
| c(1)       | 0.306601    | 0.125989   | 2.43355     | 0.0161112 |
| c(2)       | −0.64008    | 0.280023   | −2.2858     | 0.0236481 |
| c(3)       | 0.306749    | 0.040223   | 7.626242    | 2.45E-12  |
| c(4)       | −0.4616     | 0.050503   | −9.13994    | 3.75E-16  |
| c(5)       | 0.582774    | 0.115473   | 5.046853    | 1.27E-06  |
| c(6)       | 0.13037     | 0.028106   | 4.638562    | 7.51E-06  |
| c(7)       | −0.14457    | 0.042163   | −3.42883    | 0.0007803 |
| c(8)       | −0.2129     | 0.056051   | −3.79838    | 0.0002101 |
| c(9)       | 0.940451    | 0.141303   | 6.65555     | 4.82E-10  |
| c(10)      | −0.78012    | 0.122989   | −6.34302    | 2.45E-09  |
| c(11)      | 0.540342    | 0.030012   | 18.00435    | 1.60E-39  |
| c(12)      | −0.46646    | 0.070064   | −6.65759    | 4.77E-10  |
| c(13)      | 1.086867    | 0.046148   | 23.55169    | 1.38E-52  |
| c(14)      | −1.22309    | 0.051193   | −23.8916    | 2.48E-53  |
| c(15)      | 0.492234    | 0.07655    | 6.430267    | 1.56E-09  |
| c(16)      | −0.39337    | 0.0287     | −13.7063    | 2.39E-28  |
| c(17)      | 1.01984     | 0.101599   | 10.03791    | 1.66E-18  |
| c(18)      | −0.8892     | 0.095385   | −9.32216    | 1.26E-16  |
| c(19)      | 0.457512    | 0.122083   | 3.747537    | 0.0002531 |
| c(20)      | −0.52278    | 0.058669   | −8.91068    | 1.46E-15  |
| c(21)      | 1.512662    | 0.228653   | 6.61553     | 5.95E-10  |
| c(22)      | −1.74819    | 0.253013   | −6.90948    | 1.25E-10  |
| c(23)      | 0.730626    | 0.163282   | 4.474613    | 1.49E-05  |
| c(24)      | 0.729524    | 0.077765   | 9.381098    | 8.85E-17  |
| c(25)      | 0.532158    | 0.139174   | 3.823693    | 0.0001914 |
| c(26)      | −0.24892    | 0.065536   | −3.7982     | 0.0002102 |
| c(27)      | 0.206372    | 0.052335   | 3.943296    | 0.0001223 |
| c(28)      | −0.38015    | 0.0913     | −4.16373    | 5.23E-05  |
| c(29)      | 0.343602    | 0.049807   | 6.898688    | 1.33E-10  |
| c(30)      | 0.178478    | 0.045995   | 3.880364    | 0.000155  |
| c(31)      | −1.00173    | 0.120293   | −8.32743    | 4.48E-14  |
| c(32)      | 0.312532    | 0.117606   | 2.65744     | 0.0087153 |
| c(33)      | 0.263697    | 0.032537   | 8.10445     | 1.62E-13  |
| c(34)      | −0.11243    | 0.05481    | −2.0513     | 0.041954  |
| c(35)      | 0.223479    | 0.040543   | 5.512165    | 1.48E-07  |
| c(36)      | −0.22669    | 0.066706   | −3.39839    | 0.0008656 |
| c(37)      | 0.410337    | 0.078538   | 5.224706    | 5.30E-07  |
| c(38)      | −0.79341    | 0.152393   | −5.20636    | 5.77E-07  |
| c(39)      | 0.246874    | 0.109319   | 2.258289    | 0.0252624 |
| c(40)      | 1.014128    | 0.223294   | 4.54167     | 1.08E-05  |
Table 24  (Continued)

| Estimation | Coefficient | Std. error | t-statistic | Prob.        |
|------------|-------------|------------|-------------|--------------|
| c(41)      | 0.158335    | 0.081972   | 1.931566    | 0.0551585    |
| c(42)      | -0.3044     | 0.14473    | -2.10325    | 0.0369891    |
| c(42)      | -0.3044     | 0.14473    | -2.10325    | 0.0369891    |
| c(43)      | 0.353333    | 0.085985   | 4.109225    | 6.29E-05     |
| c(44)      | 0.607509    | 0.186953   | 3.249529    | 0.0014058    |
| c(45)      | -0.88958    | 0.272764   | -3.26134    | 0.001352     |
| c(46)      | -0.59086    | 0.180956   | -3.2652     | 0.0013348    |
| c(47)      | 0.200071    | 0.023126   | 8.651512    | 4.78E-15     |
| c(48)      | -0.51659    | 0.051403   | -10.0498    | 9.01E-19     |
| c(49)      | 0.012438    | 0.001323   | 9.400312    | 5.06E-17     |
| c(50)      | -0.02672    | 0.002535   | -10.5384    | 4.19E-20     |
| c(51)      | 1.079729    | 0.012712   | 84.93893    | 2.99E-136    |
| c(52)      | -1.19794    | 0.103191   | -11.6089    | 4.67E-23     |
| c(53)      | 0.660945    | 0.10392    | 6.360122    | 1.97E-09     |
| c(54)      | 0.175152    | 0.019104   | 9.168604    | 2.09E-16     |
| c(55)      | -0.31296    | 0.031561   | -9.91593    | 2.08E-18     |
| c(56)      | 0.292367    | 0.030034   | 9.734402    | 6.42E-18     |
| c(57)      | 1.046782    | 0.020545   | 50.9516     | 1.23E-101    |
| c(58)      | -0.78373    | 0.015172   | -51.6567    | 1.51E-102    |
| c(59)      | 0.534862    | 0.046339   | 11.54236    | 7.15E-23     |
| c(60)      | 0.779652    | 0.034143   | 22.83479    | 1.64E-52     |
| c(61)      | -0.01889    | 0.003623   | -5.21494    | 9.04E-06     |
| c(62)      | 0.152942    | 0.014253   | 10.73059    | 1.86E-12     |
| c(63)      | 5.864809    | 2.511417   | 2.335259    | 2.56E-02     |
| c(64)      | 0.805251    | 0.063548   | 12.67163    | 1.96E-14     |
| c(65)      | 0.249173    | 0.044659   | 5.579505    | 9.93E-08     |
| c(66)      | -0.61859    | 0.08038    | -7.69586    | 1.30E-12     |
| c(67)      | -0.03635    | 0.010982   | -3.31009    | 0.0011496    |
| c(68)      | -0.13208    | 0.015079   | -8.75877    | 2.51E-15     |
### Table 25  System residual cross-correlations—OLS: ordered by variables, 5 lags

|      | d(sca1) | d(sca2) | d(sca3) | d(sca4) | d(sca5) | d(sca6) | d(sca7) | d(sca8) | d(sca9) | d(sca10) | d(sra1) |
|------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|---------|
| d(sca1) | 1       | -0.20436 | -0.08028 | -0.091888 | -0.1558 | -0.32513 | -0.09166 | 0.127159 | 0.126493 | -0.1381 | -0.102451 |
| d(sca1(-1)) | 0.238371 | 0.100513 | 0.069354 | -0.188872 | 0.501609 | 0.197367 | 0.144698 | -0.16862 | 0.007396 | 0.242583 | 0.369804 |
| d(sca1(-2)) | 0.464957 | -0.00573 | -0.20809 | -0.126914 | -0.1924 | -0.47671 | -0.413 | -0.20746 | 0.469117 | -0.27781 | 0.159137 |
| d(sca1(-3)) | 0.014023 | -0.16512 | 0.282422 | -0.381427 | 0.084076 | -0.12379 | 0.256522 | 0.033792 | 0.141903 | 0.265038 | 0.27344 |
| d(sca1(-4)) | 0.080867 | -0.15566 | -0.19726 | -0.163086 | -0.19362 | -0.4359 | -0.38842 | 0.053464 | 0.283662 | 0.091934 | 0.07346 |
| d(sca1(-5)) | 0.048466 | 0.223342 | 0.019214 | -0.201697 | -0.06186 | -0.10777 | 0.215485 | -0.01232 | -0.01762 | 0.143215 | 0.148988 |
| d(sca2) | -0.20436 | 1       | -0.02033 | 0.280442 | 0.078604 | 0.169666 | 0.035075 | -0.26527 | -0.04301 | 0.00944 | 0.029148 |
| d(sca2(-1)) | 0.304251 | -0.33059 | 0.244168 | 0.176977 | -0.10405 | -0.14067 | 0.231152 | 0.378946 | 0.388916 | 0.0737 | 0.130203 |
| d(sca2(-2)) | 0.180376 | -0.30009 | -0.21838 | -0.249673 | 0.428553 | 0.164485 | -0.12539 | -0.12696 | -0.24927 | -0.02269 | -0.100335 |
| d(sca2(-3)) | 0.08852 | 0.372942 | -0.1118 | 0.285574 | -0.12179 | -0.05929 | -0.41894 | -0.28013 | -0.01267 | -0.12782 | -0.207659 |
| d(sca2(-4)) | 0.008295 | -0.18485 | 0.290198 | -0.19912 | 0.042257 | 0.051865 | 0.328405 | 0.133748 | 0.051816 | 0.093589 | 0.054134 |
| d(sca2(-5)) | -0.04955 | -0.25392 | -0.05879 | -0.027027 | -0.08283 | -0.12925 | -0.11605 | -0.01391 | -0.17007 | 0.006302 | 0.109683 |
| d(sca3) | -0.08028 | -0.02033 | 1       | 0.308264 | 0.158787 | 0.323551 | 0.590183 | 0.708803 | 0.13217 | 0.640846 | -0.180649 |
| d(sca3(-1)) | 0.337497 | -0.43834 | -0.06704 | 0.204933 | -0.3463 | -0.18626 | -0.26524 | 0.377639 | -0.27634 | 0.1118 | 0.04193 |
| d(sca3(-2)) | 0.03907 | 0.297628 | -0.04003 | 0.024955 | 0.060329 | 0.089449 | 0.216249 | -0.06979 | -0.17868 | -0.0111 | 0.161203 |
| d(sca3(-3)) | 0.034735 | 0.034321 | -0.10186 | -0.267631 | -0.04657 | 0.06572 | 0.169739 | -0.19723 | 0.436332 | -0.44161 | 0.119385 |
| d(sca3(-4)) | 0.083949 | 0.18535 | 0.223897 | -0.162403 | 0.026417 | -0.16438 | 0.322092 | 0.048802 | 0.175681 | 0.129771 | -0.011604 |
| d(sca3(-5)) | 0.398427 | -0.26411 | -0.03919 | -0.058797 | -0.35541 | -0.48231 | -0.19285 | 0.174301 | 0.121024 | 0.218617 | 0.015848 |
| d(sca4) | -0.09189 | 0.280442 | 0.308264 | 1       | -0.0906 | 0.211281 | -0.15044 | 0.382849 | -0.24187 | 0.286144 | -0.096679 |
| d(sca4(-1)) | 0.237643 | -0.54796 | 0.065513 | 0.095888 | 0.034277 | 0.243114 | 0.108567 | 0.215664 | -0.23957 | -0.22748 | -0.183252 |
| d(sca4(-2)) | -0.25775 | 0.09267 | -0.041 | 0.001857 | 0.254398 | 0.459795 | 0.011027 | -0.3158 | -0.29426 | -0.31956 | -0.312641 |
| d(sca4(-3)) | 0.060369 | 0.208651 | 0.431494 | 0.166593 | -0.48511 | -0.1802 | 0.095936 | 0.136077 | 0.145572 | -0.05945 | -0.242455 |
| d(sca4(-4)) | -0.01631 | -0.45796 | 0.391378 | -0.170627 | -0.18053 | -0.16552 | 0.393599 | 0.541904 | -0.05571 | 0.479824 | 0.123879 |
| \( d(\text{sca}_4(-5)) \) | 0.308314 | 0.083025 | −0.28778 | −0.186627 | −0.22081 | −0.2977 | −0.13306 | 0.018216 | −0.01406 | −0.07198 | 0.0013 |
| \( d(\text{sca}_5) \) | −0.1558 | 0.078604 | 0.158787 | −0.0906 | 1 | 0.710568 | 0.354184 | −0.06044 | 0.215431 | 0.139468 | 0.058226 |
| \( d(\text{sca}_5(-1)) \) | 0.23506 | 0.13743 | −0.27551 | 0.392722 | −0.32507 | −0.13605 | −0.58393 | −0.36561 | −0.11694 | −0.44898 | −0.160362 |
| \( d(\text{sca}_5(-2)) \) | −0.14596 | −0.2944 | 0.416933 | 0.008684 | 0.124961 | 0.006619 | 0.231986 | 0.219797 | −0.13243 | 0.37878 | −0.011586 |
| \( d(\text{sca}_5(-3)) \) | 0.037532 | −0.45536 | −0.25905 | −0.291073 | −0.17605 | −0.10479 | −0.39156 | −0.10578 | −0.06973 | −0.32215 | −0.329483 |
| \( d(\text{sca}_5(-4)) \) | −0.32546 | 0.563786 | 0.429299 | 0.129662 | −0.04891 | 0.153143 | 0.298213 | 0.085797 | −0.17367 | 0.334916 | 0.074596 |
| \( d(\text{sca}_5(-5)) \) | −0.09185 | −0.3443 | 0.042503 | 0.222039 | −0.35538 | −0.21477 | 0.002511 | 0.424443 | 0.214301 | 0.138713 | 0.354686 |
| \( d(\text{sca}_6) \) | −0.32513 | 0.169666 | 0.323551 | 0.211281 | 0.710658 | 1 | 0.451651 | −0.01105 | −0.20956 | −0.02033 | −0.202087 |
| \( d(\text{sca}_6(-1)) \) | 0.043414 | 0.111258 | 0.020595 | 0.66825 | −0.29507 | 0.015686 | −0.33303 | −0.01241 | −0.1869 | −0.23653 | −0.198904 |
| \( d(\text{sca}_6(-2)) \) | 0.007598 | −0.45947 | 0.349134 | −0.020629 | −0.07793 | 0.050664 | 0.263848 | 0.239835 | −0.25073 | 0.087027 | −0.190373 |
| \( d(\text{sca}_6(-3)) \) | −0.07874 | −0.16756 | −0.07382 | −0.241908 | −0.06333 | 0.063685 | −0.15592 | −0.05828 | −0.07023 | −0.18899 | −0.361577 |
| \( d(\text{sca}_6(-4)) \) | −0.01622 | 0.488009 | 0.41089 | 0.107069 | −0.32783 | −0.08124 | 0.356004 | 0.173416 | −0.06044 | 0.211333 | −0.069367 |
| \( d(\text{sca}_6(-5)) \) | 0.080902 | −0.32704 | 0.128741 | −0.005854 | −0.22099 | −0.22411 | 0.24531 | 0.441717 | 0.176585 | 0.298198 | 0.466716 |
| \( d(\text{sca}_7) \) | −0.09166 | 0.035075 | 0.590183 | −0.150443 | 0.354184 | 0.451651 | 1 | 0.287952 | 0.070501 | 0.300115 | 0.04842 |
| \( d(\text{sca}_7(-1)) \) | 0.239444 | −0.03452 | −0.38151 | 0.084055 | −0.28759 | −0.2851 | −0.37584 | −0.12573 | −0.03451 | −0.16027 | 0.228464 |
| \( d(\text{sca}_7(-2)) \) | 0.157694 | 0.19669 | 0.046793 | −0.069873 | 0.088277 | −0.17645 | 0.146565 | 0.017491 | 0.159334 | 0.15294 | 0.102864 |
| \( d(\text{sca}_7(-3)) \) | 0.162717 | −0.23252 | −0.27738 | −0.383346 | 0.092196 | 0.021942 | −0.0562 | −0.2275 | 0.194938 | −0.30508 | −0.083403 |
| \( d(\text{sca}_7(-4)) \) | 0.11452 | 0.428296 | 0.117604 | −0.022638 | 0.109974 | −0.08834 | 0.093916 | −0.14617 | −0.05 | 0.144818 | −0.015269 |
| \( d(\text{sca}_7(-5)) \) | 0.170686 | −0.34892 | 0.056968 | 0.092562 | −0.22715 | −0.28749 | −0.21879 | 0.188461 | 0.169256 | 0.221837 | 0.300966 |
| \( d(\text{sca}_8) \) | 0.127159 | −0.26527 | 0.708803 | 0.382849 | −0.06044 | −0.01105 | 0.287952 | 1 | 0.174083 | 0.695733 | −0.118307 |
| \( d(\text{sca}_8(-1)) \) | 0.359221 | −0.16507 | −0.18538 | 0.093641 | 0.036319 | 0.233419 | 0.011879 | 0.15942 | −0.38786 | −0.07879 | −0.014911 |
| \( d(\text{sca}_8(-2)) \) | 0.011789 | 0.561056 | −0.08789 | 0.253803 | 0.161084 | 0.264968 | 0.157299 | −0.27697 | −0.00863 | −0.21218 | 0.211926 |
| \( d(\text{sca}_8(-3)) \) | 0.227778 | −0.18849 | 0.047901 | −0.243131 | −0.06513 | −0.08946 | 0.215611 | −0.10826 | 0.423988 | −0.39761 | 0.022347 |
|       | d(sca1)  | d(sca2)  | d(sca3)  | d(sca4)  | d(sca5)  | d(sca6)  | d(sca7)  | d(sca8) | d(sca9)  | d(sca10) | d(sra1) |
|-------|----------|----------|----------|----------|----------|----------|----------|---------|----------|-----------|---------|
| d(sca8) | 0.145551 | −0.1495  | 0.16415  | −0.30329 | 0.01913  | −0.21426 | 0.07210  | 0.009178 | 0.042069 | 0.161423  | −0.188076 |
| d(sca9) | 0.371743 | 0.002318 | 0.031956 | −0.10787 | −0.375  | −0.49603 | −0.24498 | 0.150834 | 0.098627 | 0.290866  | −0.101475 |
| d(sca10) | 0.126493 | −0.04301 | 0.13217  | −0.241865 | 0.215431 | −0.20956 | 0.075051 | 0.174083 | 1       | 0.03095   | 0.19582 |
|       | 0.152794 | −0.03475 | −0.11232 | −0.214269 | 0.001097 | −0.0703  | 0.001794 | −0.09724 | −0.11135 | 0.045365  | 0.001894 |
| d(sca11) | 0.163243 | 0.1315   | −0.17428 | 0.180316  | −0.06756 | −0.32416 | −0.20934 | −0.03024 | −0.04258 | 0.23071   | 0.032816 |
| d(sca12) | 0.254008 | −0.16174 | −0.23515 | −0.451669 | 0.143816 | 0.030617 | 0.028699 | −0.26846 | 0.058293 | −0.26674  | 0.065711 |
| d(sca13) | −0.27762 | 0.245495 | −0.02308 | 0.058829  | 0.311047 | 0.139846 | −0.06628 | −0.25418 | 0.020193 | 0.073877  | 0.240799 |
| d(sca14) | 0.080926 | −0.19668 | 0.075819 | 0.154405  | −0.27322 | −0.29693 | −0.34279 | 0.134797 | 0.248776 | 0.002247  | 0.066301 |
| d(sca15) | −0.1381  | 0.00944  | 0.640846 | 0.286144  | 0.139468 | −0.02033 | 0.300115 | 0.695733 | 0.03095  | 1         | 0.241824 |
| d(sca16) | 0.488922 | −0.32373 | −0.50933 | −0.02184  | −0.28367 | −0.28645 | −0.37907 | 0.059262 | −0.09706 | −0.25481  | 0.138613 |
| d(sca17) | −0.30032 | 0.5107   | −0.05599 | −0.054073 | 0.533023 | 0.514324 | 0.352901 | −0.37042 | −0.05847 | −0.09713  | 0.327759 |
| d(sca18) | 0.052918 | −0.03322 | −0.12229 | 0.087361  | −0.15135 | −0.13518 | −0.22174 | −0.15294 | 0.515574 | −0.44955  | −0.05172 |
| d(sca19) | 0.017396 | −0.18244 | 0.314692 | −0.149584 | 0.08688  | −0.02754 | 0.245004 | 0.143241 | −0.16334 | 0.267288  | −0.252981 |
| d(sca20) | 0.164792 | −0.21057 | −0.17911 | 0.031792  | −0.26818 | −0.26656 | −0.39649 | 0.032564 | −0.15324 | 0.094664  | −0.243106 |
| d(sra1) | −0.10245 | 0.029148 | −0.18065 | −0.096679 | 0.058226 | −0.20209 | 0.04842  | −0.11831 | 0.19582  | 0.241824  | 1         |
| d(sra2) | −0.01562 | −0.07957 | −0.5937  | −0.347242 | 0.026614 | −0.37394 | −0.37163 | −0.32717 | 0.51043  | −0.4135   | 0.279592 |
| d(sra3) | −0.22807 | 0.207868 | −0.05635 | −0.277841 | 0.219646 | 0.161013 | 0.118702 | −0.3078  | 0.163825  | −0.15584  | −0.275141 |
| d(sra4) | 0.032613 | 0.067573 | 0.019157 | 0.140028  | −0.09389 | −0.14785 | −0.10516 | 0.04092  | −0.07359 | 0.193097  | −0.267478 |
| d(sra5) | 0.190533 | −0.20374 | −0.06083 | 0.022614  | −0.01331 | −0.09267 | −0.027   | 0.02458  | −0.38972 | 0.18656   | 0.059843 |
| d(sra6) | −0.18016 | −0.03542 | −0.22848 | 0.006725  | 0.295864 | 0.212983 | −0.30699 | −0.21726 | −0.01955 | −0.08501  | 0.252188 |
| d(sra7) | −0.07831 | 0.32901  | 0.416388 | 0.063816  | 0.162032 | 0.129893 | 0.485695 | 0.429645 | −0.01105 | 0.559134  | −0.115176 |
| d(sra8) | 0.736849 | −0.13907 | −0.16066 | 0.178032  | −0.24915 | −0.2986 | −0.06093 | 0.193442 | −0.04055 | −0.02107  | 0.004782 |
| d(sra9) | 0.188637 | 0.16553  | −0.10458 | −0.163716 | 0.548817 | 0.302653 | 0.104322 | −0.2198  | −0.00856 | 0.092487  | 0.417636 |
Table 25 (Continued)

|                | d(sca2) | d(sca2) | d(sca3) | d(sca4) | d(sca5) | d(sca6) | d(sca7) | d(sca8) | d(sca9) | d(sca10) | d(sra1) |
|----------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| d(sra2(-3))    | 0.206172| 0.076853| -0.32452| 0.031531| 0.072747| -0.1541| -0.37742| -0.35384| 0.386884| -0.4271 | 0.017178|
| d(sra2(-4))    | 0.119296| -0.13247| 0.324196| -0.264832| 0.025224| -0.05166| 0.192877| -0.0656 | 0.034185| 0.034527| -0.075003|
| d(sra2(-5))    | -0.0593 | -0.31902| 0.047672| -0.002626| -0.12295| -0.28542| -0.37138| 0.206344| 0.070294| 0.345249| -0.037706|
| d(sra3)        | -0.25228| 0.075665| 0.063403| 0.239771| -0.11273| -0.07825| -0.25651| 0.337649| -0.19897| 0.358662| 0.152756|
| d(sra3(-1))    | -0.00212| 0.038102| 0.041641| 0.061075| -0.24545| 0.092911| 0.259878| 0.15256| 0.122733| -0.28139| -0.003856|
| d(sra3(-2))    | -0.24681| 0.200018| 0.129231| -0.076733| 0.22319| 0.372671| 0.478427| 0.018211| 0.068009| -0.05022| 0.127689|
| d(sra3(-3))    | 0.267123| 0.092183| -0.08774| 0.196836| -0.30694| -0.31462| -0.05399| 0.041215| 0.135565| -0.1267 | -0.164458|
| d(sra3(-4))    | 0.32863 | -0.11757| 0.029419| -0.35513| 0.078781| -0.04592| 0.254064| -0.00151| -0.02458| 0.087049| -0.125362|
| d(sra3(-5))    | 0.274028| 0.148488| -0.25478| -0.189916| 0.091188| -0.14807| -0.09332| -0.25605| -0.00147| -0.04562| -0.021609|
| d(sra4)        | -0.15118| 0.456694| 0.180554| 0.403007| -0.41297| -0.1513| -0.18561| 0.056756| -0.37189| 0.202098| -0.169645|
| d(sra4(-1))    | 0.358795| -0.46871| 0.412758| 0.068594| -0.29112| -0.3238| 0.289124| 0.651837| 0.129606| 0.350978| 0.032522|
| d(sra4(-2))    | 0.000777| -0.10651| -0.23706| -0.369005| 0.348545| 0.343085| -0.00448| -0.10075| -0.09287| -0.08452| 0.165805|
| d(sra4(-3))    | -0.00525| 0.740731| -0.03365| 0.410241| -0.12344| -0.08055| -0.03193| -0.15598| 0.195578| -0.11234| 0.095176|
| d(sra4(-4))    | 0.222947| -0.43336| 0.171436| -0.231282| -0.09752| -0.09078| 0.374575| 0.166814| 0.225279| -0.04849| 0.166346|
| d(sra4(-5))    | 0.095831| -0.08573| -0.25757| -0.271589| 0.264268| -0.08594| -0.19759| -0.1584| -0.02162| -0.00048| -0.196851|
| d(sra5HP)      | -0.15832| -0.041| -0.08973| -0.484778| -0.45387| -0.36986| 0.281651| -0.15548| 0.019681| -0.15794| 0.012781|
| d(sra5HP(-1))  | -0.01183| 0.162322| -0.00436| -0.47444| -0.24246| -0.37893| 0.297076| 0.050355| 0.268908| 0.150439| 0.072113|
| d(sra5HP(-2))  | 0.23112| 0.242049| -0.11534| -0.196278| -0.07548| -0.30124| 0.155821| 0.116057| 0.241715| 0.281613| 0.298523|
| d(sra5HP(-3))  | 0.319503| 0.185394| -0.36963| -0.052495| 0.248699| -0.12211| -0.02377| -0.10274| 0.170498| 0.091223| 0.398505|
| d(sra5HP(-4))  | 0.273866| 0.119377| -0.4419| -0.090921| 0.424209| 0.083386| -0.21322| -0.4489| 0.181489| -0.30057| 0.165622|
| d(sra5HP(-5))  | 0.057535| 0.03265| -0.09783| 0.00062| 0.362275| 0.122477| -0.2713| -0.3741| 0.121691| -0.17591| -0.102379|
| d(sra5HPd)     | -0.02582| -0.65912| -0.06508| -0.196108| 0.296115| 0.237845| 0.073186| 0.237649| 0.087111| -0.16249| -0.122776|
| d(sra5HPd(-1)) | -0.31994| 0.40589| -0.11559| 0.132954| 0.248179| 0.562101| -0.08343| -0.41851| -0.35515| -0.38314| -0.394828|
|                   | d(sca1) | d(sca2) | d(sca3) | d(sca4) | d(sca5) | d(sca6) | d(sca7) | d(sca8) | d(sca9) | d(sca10) | d(sra1) |
|-------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|---------|
| d(sra5HPd(−2))   | −0.13342| 0.202133| 0.489677| 0.576155| −0.37648| −0.04846| 0.095292| 0.299402| 0.029764| 0.203793 | −0.090327|
| d(sra5HPd(−3))   | 0.072693| −0.72256| 0.058956| −0.219541| −0.03798| −0.03037| 0.187078| 0.346583| −0.21928| 0.070762 | −0.128232|
| d(sra5HPd(−4))   | −0.02532| 0.312753| −0.15893| −0.031589| −0.02192 | 0.118887| −0.11456| −0.25496| −0.25743 | −0.18744 | −0.202893|
| d(sra5HPd(−5))   | −0.08591| 0.343021| 0.3183  | 0.16489  | −0.14448| 0.03136 | 0.232126| 0.187184| 0.301052| 0.155588 | 0.191555 |
| d(sra6)          | 0.079354| 0.105344| 0.085949| −0.270728| 0.454158 | 0.329718| 0.313739| 0.043965| 0.505304| −0.09948 | −0.135169|
| d(sra6(−1))      | 0.057229| 0.2963  | −0.00753| 0.486099 | 0.230269| 0.189335| −0.16484| −0.00869| −0.1936  | 0.244362 | 0.054956 |
| d(sra6(−2))      | 0.353631| −0.28772| −0.18509| 0.330146 | −0.03243| −0.17142| −0.34132| 0.004231| −0.17732 | −0.03542 | −0.048348|
| d(sra6(−3))      | −0.09813| −0.26149| −0.1811 | −0.36198 | 0.454508 | 0.433039| −0.09523| −0.42312| −0.19465 | −0.37987 | −0.224681|
| d(sra6(−4))      | −0.31228| 0.303426| 0.269713| 0.254556 | −0.11445| 0.075851| −0.17497| −0.15269| −0.02812 | −0.06903  | −0.192689|
| d(sra6(−5))      | −0.16875| −0.44392| 0.554227| 0.190321 | −0.42338| −0.21782| 0.083623| 0.613343| −0.00496 | 0.444755 | 0.105625 |
| d(sra7)          | 0.285423| 0.153645| 0.143524| 0.634831 | −0.09618| 0.112987| 0.146996| 0.272394| −0.4718  | 0.262607 | −0.135284|
| d(sra7(−1))      | 0.320828| −0.20743| −0.16797| 0.059214 | 0.217958| 0.17851 | −0.07996| −0.06827| −0.14212 | −0.12321 | 0.214895 |
| d(sra7(−2))      | −0.08702| 0.085241| −0.17459| −0.072173| 0.364089| 0.277448| −0.14387| −0.39749| 0.099808 | −0.40776 | −0.076371|
| d(sra7(−3))      | 0.004763| 0.013737| 0.364363| 0.0467  | −0.25108| −0.09011| 0.0092  | −0.01181| 0.120599 | −0.1006  | −0.228426|
| d(sra7(−4))      | −0.07155| −0.41422| 0.372133| −0.032225| −0.19991| −0.22603| 0.030383| 0.494039| −0.04042 | 0.511155 | −0.065801|
| d(sra7(−5))      | 0.182252| −0.02457| −0.1602 | −0.12583 | −0.26709| −0.21686| 0.06897 | 0.118497| −0.20834 | 0.033663 | −0.094111|
| d(sra8HP)        | 0.085464| 0.030686| 0.262081| −0.010163| −0.29173| 0.030023| 0.471341| 0.251369| −0.10184 | −0.00868 | −0.154089|
| d(sra8HP(−1))    | 0.274697| 0.120757| 0.065064| −0.205745| −0.2182 | −0.17924| 0.373161| 0.113165| 0.109703 | 0.020486 | 0.102649|
| d(sra8HP(−2))    | 0.411478| 0.160664| −0.07155| −0.29882 | −0.08653| −0.30926| 0.253718| 0.003069| 0.297683 | 0.05078  | 0.247511 |
| d(sra8HP(−3))    | 0.493465| 0.126676| −0.18657| −0.377422| 0.063066| −0.32715| 0.094591| −0.12208| 0.376869 | 0.028276 | 0.268989 |
| d(sra8HP(−4))    | 0.470091| 0.126699| −0.21652| −0.323866| 0.157509| −0.31042| −0.05351| −0.21045| 0.328319 | 0.05358  | 0.248759 |
| d(sra8HP(−5))    | 0.401725| 0.018312| −0.19042| −0.26463 | 0.159213| −0.29005| −0.18311| −0.21577| 0.269841 | 0.062981 | 0.241184 |
| d(sra8HPd)       | −0.06692| 0.062992| −0.0988 | −0.371353| −0.12033| −0.08903| 0.10758 | 0.036451| 0.194614 | −0.01726 | 0.116522 |
Table 25  (Continued)

|               | d(sca1) | d(sca2) | d(sca3) | d(sca4) | d(sca5) | d(sca6) | d(sca7) | d(sca8) | d(sca9) | d(sca10) | d(sra1) |
|---------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|---------|
| d(sragHPd(−1)) | −0.5089 | 0.297822 | 0.170832 | 0.114387 | 0.115237 | 0.036297 | 0.392667 | 0.185869 | 0.139719 | 0.155716 | 0.097207 |
| d(sragHPd(−2)) | 0.251565 | −0.11526 | −0.03377 | 0.082948 | −0.13808 | −0.0589 | −0.05829 | 0.075424 | 0.108538 | −0.01701 | 0.298923 |
| d(sragHPd(−3)) | −0.04804 | 0.073139 | −0.21511 | 0.024383 | 0.415487 | 0.078338 | −0.12938 | −0.02349 | 0.141897 | 0.097919 | −0.020138 |
| d(sragHPd(−4)) | 0.349684 | 0.044513 | −0.25963 | −0.137283 | −0.17559 | −0.03271 | −0.00773 | −0.44355 | −0.17222 | −0.56495 | −0.38048 |
| d(sragHPd(−5)) | −0.15138 | 0.050534 | 0.33543 | −0.104596 | 0.245597 | 0.116929 | 0.201668 | −0.03033 | −0.00679 | 0.337691 | 0.177253 |
| d(srag)       | 0.08446 | 0.008764 | −0.38077 | −0.371384 | 0.382518 | 0.120217 | −0.01789 | −0.17715 | 0.186736 | −0.0629 | 0.293941 |
| d(srag(−1))   | −0.15351 | 0.458711 | −0.32607 | 0.37837 | 0.375252 | 0.183448 | −0.27746 | −0.3461 | 0.014992 | −0.06336 | 0.153266 |
| d(srag(−2))   | 0.107692 | −0.23826 | −0.08948 | 0.1436 | 0.109855 | 0.079366 | −0.23061 | −0.16105 | 0.03125 | −0.26202 | −0.146382 |
| d(srag(−3))   | −0.31079 | −0.28508 | 0.003284 | 0.031958 | 0.383384 | 0.347673 | −0.22564 | −0.1667 | −0.33379 | −0.01879 | −0.36931 |
| d(srag(−4))   | −0.13573 | 0.00072 | 0.16302 | 0.301034 | −0.30773 | 0.00209 | −0.34016 | −0.02619 | −0.31772 | −0.08653 | −0.419996 |
| d(srag(−5))   | −0.48367 | −0.24377 | 0.462731 | 0.178846 | −0.07878 | 0.238764 | 0.213926 | 0.404048 | −0.26742 | 0.368062 | 0.098698 |
| d(srag(−1l))  | −0.2292 | 0.638249 | 0.231459 | 0.20436 | 0.023671 | −0.01401 | 0.334653 | −0.13729 | 0.13404 | 0.244634 | 0.22337 |
| d(srag(−1l)(−1)) | 0.24777 | −0.4541 | −0.21768 | −0.327155 | −0.42188 | −0.49401 | −0.07242 | 0.057867 | 0.259296 | −0.12013 | 0.292055 |
| d(srag(−1l)(−2)) | −0.09903 | 0.098661 | −0.22868 | −0.365858 | 0.393825 | −0.02645 | 0.090334 | −0.18047 | −0.04548 | 0.119218 | −0.011345 |
| d(srag(−1l)(−3)) | 0.203709 | 0.283232 | −0.178 | 0.02977 | −0.22002 | −0.13695 | −0.29067 | −0.24384 | 0.223085 | −0.20417 | −0.027343 |
| d(srag(−1l)(−4)) | −0.12836 | 0.032327 | 0.16951 | 0.014689 | 0.393341 | 0.117687 | 0.252462 | 0.169338 | 0.028096 | 0.413244 | 0.251756 |
| d(srag(−1l)(−5)) | 0.253035 | −0.32093 | −0.41142 | 0.075446 | −0.14543 | −0.18154 | −0.4442 | −0.23226 | −0.14782 | −0.3671 | −0.049664 |
Table 25 (Continued)

|     | d(sra₂) | d(sra₃) | d(sra₄) | d(sra₅HP) | d(sra₅HPd) | d(sra₆) | d(sra₇) | d(sra₈HP) | d(sra₈HPd) | d(sra₉) | d(sra₁₀) |
|-----|---------|---------|---------|---------|----------|---------|---------|---------|----------|---------|---------|
| d(sca₁) | −0.07831 | −0.25228 | −0.15118 | −0.158318 | −0.02582 | 0.079354 | 0.285423 | 0.085464 | −0.06692 | 0.08446 | −0.229203 |
| d(sca₁(−1)) | 0.097945 | 0.0482 | −0.07295 | −0.146672 | −0.15985 | −0.1196 | −0.08818 | −0.03681 | 0.067278 | 0.043284 | 0.154748 |
| d(sca₁(−2)) | −0.34973 | −0.02838 | 0.09049 | −0.029424 | −0.22289 | −0.12419 | −0.31167 | −0.12925 | 0.162567 | −0.15148 | 0.024616 |
| d(sca₁(−3)) | 0.084228 | −0.04724 | −0.05481 | 0.210956 | −0.07715 | −0.07036 | −0.31506 | 0.017017 | 0.01644 | −0.05721 | 0.097095 |
| d(sca₁(−4)) | −0.07144 | 0.228974 | 0.05124 | 0.12321 | −0.12584 | −0.06605 | −0.20605 | −0.04243 | 0.194919 | 0.008565 | −0.056827 |
| d(sca₁(−5)) | 0.124835 | 0.039175 | −0.08646 | 0.133063 | −0.15383 | 0.076409 | −0.00838 | 0.040436 | 0.161872 | 0.215898 | 0.2403 |
| d(sca₂) | 0.32901 | 0.075665 | 0.456694 | −0.040997 | −0.65912 | 0.105344 | 0.153645 | 0.030686 | 0.062992 | 0.008764 | 0.638249 |
| d(sca₂(−1)) | 0.10868 | −0.53255 | −0.18414 | −0.122499 | 0.256324 | 0.306209 | 0.199611 | −0.05724 | −0.08137 | 0.08935 | −0.203069 |
| d(sca₂(−2)) | 0.013987 | 0.061978 | −0.18274 | −0.216002 | 0.229629 | −0.01081 | 0.051019 | −0.1867 | −0.35028 | 0.245706 | −0.366553 |
| d(sca₂(−3)) | −0.35637 | −0.00214 | 0.098332 | −0.169734 | −0.4158 | −0.18574 | 0.050899 | −0.12663 | 0.012026 | −0.26852 | 0.366927 |
| d(sca₂(−4)) | 0.216882 | −0.11317 | 0.091679 | 0.034743 | 0.264836 | 0.005449 | −0.26437 | −0.04193 | 0.421731 | 0.001076 | −0.239444 |
| d(sca₂(−5)) | −0.18353 | 0.177483 | 0.127219 | 0.044708 | −0.05792 | −0.19559 | 0.145028 | −0.00563 | −0.43747 | −0.18195 | −0.075049 |
| d(sca₃) | 0.416388 | 0.063403 | 0.180554 | −0.089731 | −0.06508 | 0.085949 | 0.143524 | 0.262081 | −0.0988 | −0.38077 | 0.231459 |
| d(sca₃(−1)) | −0.02418 | 0.469753 | 0.196491 | −0.019875 | 0.117831 | −0.40434 | 0.250785 | 0.317378 | 0.082579 | −0.14398 | −0.438173 |
| d(sca₃(−2)) | −0.11355 | 0.424394 | −0.16791 | 0.23579 | −0.03364 | −0.38413 | 0.03065 | 0.456515 | −0.0578 | −0.27306 | 0.429048 |
| d(sca₃(−3)) | −0.01613 | −0.264 | −0.06481 | 0.401786 | 0.047155 | 0.228623 | −0.42741 | 0.400917 | 0.476245 | −0.04767 | −0.019793 |
| d(sca₃(−4)) | 0.486833 | −0.13583 | 0.329994 | 0.358289 | −0.37877 | 0.033506 | 0.028983 | 0.286014 | −0.3586 | −0.18029 | 0.335851 |
| d(sca₃(−5)) | −0.00515 | −0.20317 | −0.1109 | 0.182116 | −0.22434 | −0.04082 | 0.1892 | 0.113151 | −0.07886 | −0.03202 | 0.024452 |
| d(sca₄) | 0.063816 | 0.239771 | 0.403009 | −0.484778 | −0.19611 | −0.27073 | 0.634831 | −0.01016 | −0.37135 | −0.37138 | 0.20436 |
| d(sca₄(−1)) | −0.28171 | 0.041168 | −0.37079 | −0.130185 | 0.718676 | −0.21472 | 0.033156 | 0.181865 | −0.05337 | −0.14038 | −0.525919 |
| d(sca₄(−2)) | −0.1138 | 0.220612 | 0.178432 | 0.181758 | −0.00579 | −0.2889 | −0.13854 | 0.36178 | −0.1249 | −0.47087 | 0.070968 |
| d(sca₄(−3)) | −0.01622 | 0.004938 | 0.420171 | 0.341752 | −0.40714 | −0.2252 | −0.13546 | 0.432412 | 0.098847 | −0.63244 | 0.35905 |
| d(sca₄(−4)) | 0.464676 | 0.22782 | 0.151514 | 0.458121 | 0.167775 | −0.23979 | −0.01918 | 0.504918 | 0.137787 | −0.25036 | −0.171814 |
|                  | d(sra2) | d(sra3) | d(sra4) | d(sra5 HP) | d(sra5 HPd) | d(sra6) | d(sra7) | d(sra8 HP) | d(sra8 HPd) | d(sra9) | d(sra10) |
|------------------|---------|---------|---------|------------|-------------|---------|---------|------------|-------------|---------|----------|
| d(sca4 (-5))     | -0.06191 | 0.37974 | -0.06886 | 0.271561 | -0.16462 | -0.09666 | 0.092159 | 0.371715 | 0.019235 | 0.011359 | 0.115555 |
| d(sca5)          | 0.162032 | -0.11273 | -0.41297 | -0.453874 | 0.296115 | 0.454158 | -0.09618 | -0.29173 | -0.12033 | 0.382518 | 0.023671 |
| d(sca5 (-1))     | -0.38677 | -0.24102 | 0.384828 | -0.277756 | -0.39636 | -0.17928 | 0.194264 | -0.23387 | -0.22735 | -0.18964 | -0.028236 |
| d(sca5 (-2))     | 0.043123 | 0.040996 | -0.0801 | 0.0087 | 0.263921 | -0.36651 | -0.10821 | -0.0847 | -0.18618 | -0.33976 | 0.016384 |
| d(sca5 (-3))     | -0.589 | 0.17244 | -0.0263 | 0.095189 | 0.247906 | -0.07271 | -0.27503 | 0.004712 | 0.252476 | -0.08627 | -0.496284 |
| d(sca5 (-4))     | 0.176766 | 0.385643 | 0.336651 | 0.082239 | -0.45401 | -0.14597 | -0.01517 | 0.152767 | 0.08226 | -0.19872 | 0.568706 |
| d(sca5 (-5))     | 0.014761 | 0.11912 | -0.01958 | 0.132788 | 0.253974 | -0.03964 | 0.03961 | 0.20567 | 0.250637 | -0.02899 | -0.230897 |
| d(sca6)          | 0.129893 | -0.07825 | -0.1513 | -0.369857 | 0.237845 | 0.329718 | 0.112987 | 0.030023 | -0.08903 | 0.120217 | -0.041042 |
| d(sca6 (-1))     | -0.16841 | 0.051495 | 0.514253 | -0.185112 | -0.22836 | -0.39488 | 0.30153 | 0.087423 | -0.31523 | -0.5148 | 0.039792 |
| d(sca6 (-2))     | -0.10676 | 0.052973 | -0.15756 | 0.226842 | 0.377722 | -0.41952 | -0.05354 | 0.309544 | -0.23811 | -0.49254 | -0.1261 |
| d(sca6 (-3))     | -0.06388 | 0.310719 | 0.13436 | 0.310119 | 0.064513 | -0.16086 | -0.30976 | 0.357552 | 0.318767 | -0.29439 | -0.190585 |
| d(sca6 (-4))     | 0.285213 | 0.215673 | 0.444347 | 0.327732 | -0.52563 | -0.1494 | 0.092266 | 0.454588 | 0.12593 | -0.34457 | 0.545547 |
| d(sca6 (-5))     | 0.228302 | 0.092621 | -0.0601 | 0.265123 | 0.162037 | -0.031 | 0.076704 | 0.349219 | 0.169983 | 0.019928 | -0.136917 |
| d(sca7)          | 0.485695 | -0.25651 | -0.18561 | 0.281651 | 0.073186 | -0.2942 | -0.13777 | 0.173777 | 0.115181 | -0.05978 | 0.044077 | -0.11327 |
| d(sca7 (-1))     | -0.02676 | 0.04869 | 0.269347 | 0.071889 | -0.2942 | -0.13777 | 0.173777 | 0.115181 | -0.05978 | 0.044077 | -0.11327 |
| d(sca7 (-2))     | 0.037535 | 0.004428 | -0.25855 | 0.102196 | -0.04824 | -0.09311 | -0.03223 | 0.056444 | -0.14476 | -0.04721 | 0.375386 |
| d(sca7 (-3))     | 0.033886 | -0.3842 | -0.14107 | 0.121012 | 0.171691 | 0.31667 | -0.22715 | -0.00847 | 0.381931 | 0.249328 | -0.363241 |
| d(sca7 (-4))     | 0.224285 | -0.04498 | 0.322795 | -0.086105 | -0.49427 | 0.006126 | 0.166687 | -0.16657 | -0.32036 | -0.01848 | 0.401431 |
| d(sca7 (-5))     | -0.2365 | -0.16203 | -0.16989 | -0.169962 | 0.02927 | -0.00948 | 0.031775 | -0.24617 | 0.096719 | 0.07202 | -0.172233 |
| d(sca8)          | 0.429645 | 0.337649 | 0.056756 | -0.15548 | 0.237649 | 0.043965 | 0.272394 | 0.251369 | 0.036451 | -0.17715 | -0.137293 |
| d(sca8 (-1))     | -0.03382 | 0.365135 | -0.151 | -0.098143 | 0.221054 | -0.12781 | 0.349827 | 0.384802 | 0.10603 | 0.127698 | -0.301964 |
| d(sca8 (-2))     | -0.0674 | 0.12283 | 0.029676 | 0.092756 | -0.23873 | -0.22615 | 0.056232 | 0.378243 | -0.01238 | -0.2742 | 0.530402 |
| d(sca8 (-3))     | 0.017779 | -0.45875 | -0.01778 | 0.359213 | 0.108108 | 0.100357 | -0.32979 | 0.307245 | 0.07598 | -0.21614 | -0.089528 |
|       | d(sra₂) | d(sra₃) | d(sra₄) | d(sra₅HP) | d(sra₅HPd) | d(sra₆) | d(sra₇) | d(sra₈HP) | d(sra₈HPd) | d(sra₉) | d(sra₁₀) |
|-------|---------|---------|---------|-----------|------------|---------|---------|-----------|------------|---------|---------|
| d(sca₈(−4)) | 0.265218 | −0.09611 | 0.202911 | 0.346314 | −0.29281 | −0.11125 | −0.05343 | 0.214273 | −0.37149 | −0.27541 | 0.125107 |
| d(sca₈(−5)) | 0.044942 | 0.081743 | 0.089474 | 0.152889 | −0.37781 | −0.1319 | 0.017042 | 0.083201 | 0.282033 | −0.08535 | 0.15169 |
| d(sca₉) | −0.01105 | −0.19897 | −0.37189 | 0.019681 | 0.087111 | 0.505304 | −0.4718 | −0.10184 | 0.194614 | 0.186736 | 0.13404 |
| d(sca₉(−1)) | 0.318379 | −0.22835 | 0.151821 | 0.083159 | −0.22676 | 0.144506 | 0.100764 | −0.01539 | −0.0851 | 0.289535 | −0.113401 |
| d(sca₉(−2)) | 0.013285 | −0.02623 | −0.01853 | −0.074619 | −0.22911 | −0.18804 | 0.336636 | −0.16244 | −0.24021 | −0.05045 | 0.296039 |
| d(sca₉(−3)) | −0.18592 | −0.30942 | −0.36513 | −0.139908 | 0.292599 | 0.296359 | −0.24543 | −0.31337 | 0.391863 | 0.467798 | −0.345843 |
| d(sca₉(−4)) | 0.00726 | 0.008928 | 0.21825 | −0.240694 | −0.24771 | 0.04476 | −0.01173 | −0.374 | −0.20949 | 0.058564 | 0.187814 |
| d(sca₉(−5)) | −0.41298 | −0.04915 | −0.13202 | −0.24877 | 0.025019 | 0.005361 | −0.12468 | −0.35133 | −0.08365 | 0.01196 | −0.100343 |
| d(sca₁₀) | 0.559134 | 0.358662 | 0.202098 | −0.157936 | −0.16249 | −0.09948 | 0.262607 | −0.00868 | −0.01726 | −0.0629 | 0.244634 |
| d(sca₁₀(−1)) | −0.36929 | 0.250502 | −0.28903 | −0.161556 | 0.318366 | −0.07809 | 0.169501 | −0.00761 | 0.197592 | 0.311848 | −0.470723 |
| d(sca₁₀(−2)) | −0.0028 | 0.066644 | −0.21296 | −0.020151 | −0.03134 | 0.05954 | −0.12519 | 0.058352 | −0.02085 | 0.119419 | 0.417576 |
| d(sca₁₀(−3)) | −0.16012 | −0.41303 | 0.092482 | 0.055553 | −0.04077 | 0.2161 | −0.23038 | −0.0256 | 0.030666 | −0.11245 | −0.074739 |
| d(sca₁₀(−4)) | 0.319199 | −0.15146 | 0.08775 | 0.150782 | −0.04271 | −0.08564 | 0.072694 | 0.053473 | −0.43175 | −0.14805 | 0.033512 |
| d(sca₁₀(−5)) | −0.12908 | 0.079282 | 0.03721 | 0.025779 | −0.09907 | −0.183 | 0.150928 | −0.00789 | 0.12376 | −0.11494 | −0.116078 |
| d(sra₁) | −0.11518 | 0.152756 | −0.16965 | 0.012781 | −0.12278 | −0.13517 | −0.13528 | −0.15409 | 0.116522 | 0.293941 | 0.22337 |
| d(sra₁(−1)) | −0.33635 | −0.03786 | −0.40671 | 0.119535 | 0.236144 | 0.151012 | −0.4757 | −0.23958 | 0.035667 | 0.313858 | −0.104958 |
| d(sra₁(−2)) | 0.162166 | −0.50079 | −0.13919 | 0.15302 | −0.12889 | 0.454542 | −0.17178 | −0.1218 | −0.06471 | 0.23144 | 0.173329 |
| d(sra₁(−3)) | 0.342347 | −0.32313 | 0.308599 | −0.136183 | −0.24022 | 0.150532 | 0.311779 | −0.28498 | −0.06191 | 0.119177 | −0.005468 |
| d(sra₁(−4)) | −0.10857 | −0.09032 | −0.13461 | −0.33239 | 0.121002 | −0.06416 | 0.388701 | −0.4075 | −0.22939 | 0.237796 | −0.182338 |
| d(sra₁(−5)) | −0.45085 | 0.196124 | −0.27762 | −0.47143 | 0.243733 | 0.048441 | −0.20148 | −0.51487 | 0.172722 | 0.295845 | −0.211465 |
| d(sra₂) | 1 | 0.030164 | 0.438573 | 0.171358 | −0.22642 | 0.210584 | 0.255294 | 0.313154 | 0.143494 | 0.041935 | 0.171932 |
| d(sra₂(−1)) | −0.04973 | −0.22338 | −0.13163 | −0.16893 | −0.09669 | 0.108995 | 0.670526 | 0.080135 | −0.35518 | 0.147036 | −0.076845 |
| d(sra₂(−2)) | −0.0163 | 0.021786 | −0.34026 | −0.307464 | 0.068539 | 0.053522 | −0.11668 | −0.19331 | 0.153725 | 0.374897 | 0.029755 |
Table 25 (Continued)

|        | d(sra2)  | d(sra3)  | d(sra4)  | d(sra5)  | d(sra5HP) | d(sra5HPd) | d(sra6)  | d(sra7)  | d(sra8)  | d(sra8HP) | d(sra8HPd) | d(sra9)  | d(sra10) |
|--------|----------|----------|----------|----------|-----------|-------------|----------|----------|----------|-----------|-------------|----------|----------|
| d(sra2(−3)) | -0.26009 | -0.20463 | 0.076031 | -0.125592 | -0.07453 | 0.007591 | -0.19706 | -0.19917 | 0.01282 | -0.11255 | -0.012497 |
| d(sra2(−4)) | -0.02958 | -0.30905 | 0.013483 | 0.069898 | -0.11415 | -0.00011 | -0.18876 | -0.09883 | -0.22982 | -0.13804 | 0.050658   |
| d(sra2(−5)) | 0.008323 | 0.260646 | 0.166973 | 0.002629 | -0.0615 | -0.22636 | -0.12104 | -0.11059 | 0.138516 | -0.16977 | -0.157162 |
| d(sra3)     | 0.030164 | 1        | 0.275984 | -0.018535 | 0.049662 | -0.546    | -0.12461 | 0.178616 | 0.267248 | -0.26453 | -0.019089 |
| d(sra3(−1)) | -0.20129 | 0.135411 | -0.24323 | 0.305687 | 0.211418 | 0.045877 | -0.0469 | 0.550416 | 0.203491 | -0.16523 | 0.094283   |
| d(sra3(−2)) | 0.443198 | -0.00108 | 0.114955 | 0.348859 | -0.01479 | 0.153171 | -0.10052 | 0.509521 | 0.066668 | -0.00023 | 0.133623   |
| d(sra3(−3)) | 0.121566 | -0.21513 | 0.150263 | 0.308979 | -0.31341 | -0.0765 | 0.31719 | 0.383068 | -0.42148 | -0.29896 | 0.28412    |
| d(sra3(−4)) | 0.272485 | -0.30306 | -0.20954 | 0.2288   | 0.043924 | 0.090901 | -0.01018 | 0.186627 | 0.123455 | 0.124888 | -0.037447 |
| d(sra3(−5)) | 0.17381  | -0.12419 | 0.189972 | 0.023547 | -0.26149 | 0.030916 | 0.112395 | -0.06446 | 0.088067 | 0.072421 | 0.060998   |
| d(sra4)     | 0.438573 | 0.275984 | 1        | 0.137411 | -0.64517 | -0.43054 | 0.232439 | 0.204685 | 0.041332 | -0.49042 | 0.223361   |
| d(sra4(−1)) | -0.06016 | 0.065703 | -0.31055 | 0.082684 | 0.319416 | -0.10513 | 0.223418 | 0.234059 | -0.15133 | -0.22399 | -0.068496 |
| d(sra4(−2)) | 0.014433 | 0.358652 | -0.21687 | -0.005038 | 0.233364 | 0.118637 | -0.27813 | 0.157501 | 0.427963 | 0.375911  | -0.346767 |
| d(sra4(−3)) | 0.043959 | 0.100341 | 0.338922 | 0.07883  | -0.57456 | -0.12261 | 0.164807 | 0.22781  | -0.13249 | -0.30711 | 0.079723   |
| d(sra4(−4)) | 0.123498 | -0.50559 | -0.25074 | 0.260561 | 0.301578 | 0.162884 | -0.1061 | 0.200141 | 0.049618 | 0.053274  | -0.250274 |
| d(sra4(−5)) | 0.157162 | 0.111269 | 0.045852 | 0.091493 | -0.06905 | -0.04615 | -0.02105 | 0.000312 | -0.26813 | 0.012083  | -0.056383 |
| d(sra5HP)   | 0.171358 | -0.01854 | 0.137411 | 1        | -0.18105 | -0.25133 | -0.30075 | 0.695554 | 0.161362 | -0.36515 | 0.277636   |
| d(sra5HP(−1)) | 0.441603 | -0.09751 | 0.070338 | 0.655165 | -0.31931 | 0.24544 | -0.12118 | 0.377363 | 0.212938 | 0.107045 | 0.305167   |
| d(sra5HP(−2)) | 0.440847 | -0.17943 | -0.04687 | 0.113068 | -0.3103 | 0.423303 | 0.217972 | -0.00054 | 0.158546 | 0.530374  | 0.186613   |
| d(sra5HP(−3)) | 0.173581 | -0.26406 | -0.29359 | -0.294863 | -0.03495 | 0.373892 | 0.291871 | -0.3491  | -0.04218 | 0.669506  | 0.022396   |
| d(sra5HP(−4)) | -0.20319 | -0.48413 | -0.37066 | -0.468667 | 0.077432 | 0.375479 | 0.05026 | -0.58736 | -0.15808 | 0.536958  | -0.100804  |
| d(sra5HP(−5)) | -0.19778 | -0.44443 | -0.05142 | -0.470603 | -0.0267 | 0.181726 | -0.11222 | -0.65328 | -0.19957 | 0.155251  | -0.094487  |
| d(sra5HPd)  | -0.22642 | 0.049662 | -0.64517 | -0.181045 | 1        | 0.181071 | -0.25047 | -0.1202 | 0.145693 | 0.249485  | -0.701927  |
| d(sra5HPd(−1)) | -0.10549 | 0.096079 | 0.243692 | -0.079322 | -0.23949 | 0.037171 | 0.056829 | 0.089742 | -0.21803 | -0.12713 | 0.153739   |
| d(sra2) | d(sra3) | d(sra4) | d(sra5) | d(sra5HP) | d(sra5HPd) | d(sra6) | d(sra7) | d(sra8) | d(sra8HP) | d(sra8HPd) | d(sra9) | d(sra10) |
|---------|---------|---------|---------|-----------|------------|---------|---------|---------|-----------|------------|---------|---------|
| 0.075886 | -0.06098 | 0.373429 | 0.026708 | -0.27217 | -0.24066 | 0.164738 | 0.174466 | -0.04356 | -0.51701 | 0.344384 |         |         |
| 0.146986 | 0.133083 | -0.12691 | 0.214448 | 0.626214 | -0.19049 | -0.00478 | 0.259703 | -0.00889 | -0.08661 | -0.594721 |         |         |
| -0.21607 | 0.292657 | 0.040432 | 0.134725 | -0.30339 | -0.13434 | 0.076111 | 0.256021 | -0.14939 | -0.18034 | 0.298497 |         |         |
| 0.221903 | -0.01008 | 0.168023 | 0.117134 | -0.19347 | 0.07981  | -0.17643 | 0.218452 | 0.517639 | -0.08425 | 0.275028 |         |         |
| 0.210584 | -0.5456  | -0.43054 | -0.251333 | 0.181071 | 1        | -0.07326 | -0.26356 | 0.13829  | 0.684777 | -0.125893 |         |         |
| 0.317968 | -0.18409 | 0.341643 | -0.559502 | -0.37646 | 0.141354 | 0.555757 | -0.39784 | -0.37736 | 0.281925 | 0.063551 |         |         |
| -0.40509 | -0.1486  | -0.29447 | -0.455943 | 0.28793  | -0.27399 | 0.33399  | -0.40628 | -0.36571 | -0.03619 | -0.197014 |         |         |
| -0.36199 | -0.07095 | -0.28393 | -0.218374 | 0.468116 | 0.017907 | -0.41718 | -0.30712 | 0.207712 | 0.09803  | -0.44068 |         |         |
| -0.18279 | 0.133293 | 0.545692 | -0.094738 | -0.42674 | -0.19168 | -0.13315 | -0.13339 | -0.09808 | -0.47829 | 0.285845 |         |         |
| -0.0372  | 0.276235 | 0.113972 | 0.077645 | 0.157879 | -0.28606 | -0.08561 | 0.099115 | 0.056066 | -0.31996 | -0.158429 |         |         |
| 0.255294 | -0.12461 | 0.232439 | -0.300752 | -0.25047 | -0.07326 | 1        | 0.095636 | -0.57891 | -0.07941 | 0.173865 |         |         |
| -0.33747 | 0.006726 | -0.41158 | -0.375801 | 0.388574 | -0.11489 | 0.048937 | -0.16825 | 0.052182 | 0.182403 | -0.296725 |         |         |
| -0.24308 | 0.02298 | 0.008075 | -0.096601 | 0.113108 | -0.07511 | -0.33565 | -0.07514 | 0.004769 | -0.17777 | -0.043599 |         |         |
| -0.1266  | -0.18308 | 0.292527 | 0.152561 | -0.29492 | -0.11097 | -0.1785 | 0.10505 | -0.1538  | -0.47432 | 0.175764 |         |         |
| 0.263101 | 0.309164 | 0.196771 | 0.215921 | 0.068528 | -0.29983 | -0.08573 | 0.202322 | 0.116176 | -0.29277 | -0.160884 |         |         |
| -0.03462 | 0.427861 | -0.01285 | 0.202805 | -0.00632 | -0.18967 | 0.108185 | 0.291081 | 0.176292 | -0.02419 | -0.016906 |         |         |
| 0.313154 | 0.178616 | 0.204685 | 0.695554 | -0.1202 | -0.26356 | 0.095636 | 1        | 0.049007 | -0.54116 | 0.255321 |         |         |
| 0.368818 | 0.039398 | 0.13445 | 0.627102 | -0.26137 | -0.08786 | 0.039777 | 0.771453 | 0.123421 | -0.22523 | 0.281551 |         |         |
| 0.337049 | -0.142   | -0.00762 | 0.446666 | -0.31005 | 0.087933 | 0.02342 | 0.451643 | 0.082679 | 0.034097 | 0.292211 |         |         |
| 0.260669 | -0.30209 | -0.11343 | 0.203276 | -0.27641 | 0.23892  | -0.0285 | 0.094997 | 0.096456 | 0.272527 | 0.169549 |         |         |
| 0.161844 | -0.34784 | -0.09767 | -0.038327 | -0.28522 | 0.241024 | -0.00778 | -0.21924 | 0.025526 | 0.339496 | 0.121719 |         |         |
| -0.02586 | -0.31609 | -0.12752 | -0.23095 | -0.18846 | 0.194451 | -0.05259 | -0.45638 | 0.023276 | 0.347952 | 0.000338 |         |         |
| 0.143494 | 0.267248 | 0.041332 | 0.161362 | 0.145693 | 0.13829  | -0.57891 | 0.049007 | 1        | 0.274634 | -0.317396 |         |         |
|               | d(sra₂)  | d(sra₃)  | d(sra₄)  | d(sra₅HP) | d(sra₅HPd) | d(sra₆)  | d(sra₇)  | d(sra₈HP) | d(sra₈HPd) | d(sra₉)  | d(sra₁₀l) |
|---------------|----------|----------|----------|------------|------------|----------|----------|------------|------------|----------|------------|
| d(sra₈HPd(−1)) | 0.37641  | 0.036996 | 0.18074  | 0.077906   | −0.17868   | 0.208367 | 0.312864 | 0.182499   | −0.29385   | −0.00868 | 0.337861   |
| d(sra₈HPd(−2)) | −0.19516 | −0.222   | −0.27557 | −0.125288  | −0.06132   | 0.18867  | 0.140969 | −0.01944   | −0.12102   | 0.271062 | −0.066807  |
| d(sra₈HPd(−3)) | 0.243988 | 0.165218 | −0.10641 | −0.104528  | 0.199267   | −0.05199 | −0.10737 | −0.07835   | 0.066269   | 0.115834 | −0.022019  |
| d(sra₈HPd(−4)) | −0.22492 | −0.57039 | −0.02159 | 0.117075   | −0.12687   | 0.098713 | 0.197799 | 0.046481   | −0.1952    | −0.0755  | 0.01356    |
| d(sra₈HPd(−5)) | 0.197273 | −0.11396 | 0.17261  | −0.083801  | −0.18596   | −0.0173  | −0.12923 | −0.2208    | 0.009627   | −0.03997 | 0.132283   |
| d(sra₉)       | 0.041935 | −0.26453 | −0.49042 | −0.365153  | 0.249485   | 0.684777 | 0.07941  | −0.54116   | 0.274634   | 1        | −0.32919   |
| d(sra₉(−1))   | −0.03669 | −0.22531 | 0.012726 | −0.568572  | −0.20597   | 0.24335  | 0.320544 | −0.62226   | −0.36395   | 0.37097  | 0.210435   |
| d(sra₉(−2))   | −0.38002 | −0.51751 | −0.30704 | −0.500054  | 0.326698   | 0.185098 | 0.02172  | −0.61409   | −0.22096   | 0.211334 | −0.326312  |
| d(sra₉(−3))   | −0.12849 | −0.00516 | 0.042397 | −0.358765  | 0.298681   | −0.11774 | −0.07635 | −0.45709   | −0.2137    | −0.0705  | −0.360018  |
| d(sra₉(−4))   | −0.43963 | 0.184704 | 0.25925  | −0.234842  | −0.11813   | −0.29442 | 0.042309 | −0.22132   | −0.08127   | −0.38797 | −0.007701  |
| d(sra₉(−5))   | 0.009702 | 0.452969 | 0.123364 | −0.026925  | 0.31319    | −0.28479 | −0.13981 | 0.066989   | 0.287077   | −0.22866 | −0.179804  |
| d(sra₁₀l)     | 0.171932 | 0.01909  | 0.223361 | 0.277636   | −0.70193   | −0.12589 | 0.173865 | 0.255321   | −0.3174    | −0.32919 | 1          |
| d(sra₁₀l(−1)) | 0.005599 | −0.32033 | −0.1354  | 0.292328   | 0.213216   | 0.080061 | −0.23024 | 0.017578   | 0.383578   | 0.246448 | −0.409547  |
| d(sra₁₀l(−2)) | 0.239986 | 0.084746 | −0.14234 | 0.11154    | −0.00767   | 0.099154 | 0.023602 | −0.10181   | −0.32121   | 0.220353 | 0.14672    |
| d(sra₁₀l(−3)) | −0.26232 | −0.39254 | −0.09161 | −0.17551   | −0.36567   | 0.370237 | 0.018441 | −0.27274   | 0.240698   | 0.286826 | 0.138417   |
| d(sra₁₀l(−4)) | 0.490922 | −0.02283 | 0.096379 | −0.27697   | 0.171625   | 0.104078 | 0.03092  | −0.35476   | 0.090959   | 0.307841 | −0.098449  |
| d(sra₁₀l(−5)) | −0.58786 | −0.19166 | −0.2258  | −0.273407  | 0.109888   | −0.01422 | 0.283923 | −0.33411   | −0.49421   | 0.074032 | −0.272728  |
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