332.05

. .

,
11–85%.   -
                                                                                       -
                              .
                                                                                ,   -
                                                                                       .

                              .   -
                                                                                         -
                                        .   ,   -
                                                                                         -
                              ,
MIMIC.
             .   ,   ,
       ,   -
                                        .

                              :   ;   -
             ;   ;   ; MIMIC-   ;   -

                      –   .
       ,
                              .   -

-
,   -
.

[26]

(7%
53%   ,   ).   -
,   .   [32]
,   -
.   -
,   ,   ,   -
,   .   -
                                                                     -
.
,
.   .
,   ,
                                                                     -

[12],
(,
2003 .   25,5%
[4]),   -
.
                                                                     -
.   -

.
,   -
,   ,
.

,   -
.   ,   -
.   -
.

,   -

,   .

,   ,   -

.   -

,

,   -

.

[1].

(,   ,   ).

,   ,   -

.   2002 .

18,75%   ,   60,4%   –   ,

25% –   , 14,6% –   -

.   -

, ,   ,   ,   -

.

,   .   -

,   -

,   -

.   -

,   -

.

.   -

(,   )   ,

.   ,   -

,   .   -

. , . . , . . -

[6] , -

. -

. -

. -

. , -

. -

. , -

. -

. :

$$X_{employment} = \frac{U_{ilo} - U_{fsz}}{L - U_{fsz}},$$

$U_{ilo} -$;

$U_{fsz} -$; $L -$ -

. -

, -

, , -

, -

. [5], -

1995 . -

5,8% . -

, -

. -

, ,

« » , -

, . . -

, -

.   -
.   -
                                          -
.   -

,   -
.   ,
,   .   -
.   -
,   -
.   ,   -
,   ,   -
.   -
        [10]   -
    1919–1955   .   20   -
    [14; 21; 33; 34].   ,
        [34]
1929–1980   .,   .

                    (0/   2)   [34]

$$\ln(C/M_2)_t = {}_0 + {}_1 \ln(1+TW)_t + {}_2 \ln(WS/Y)_t +$$
$$+ {}_3 \ln R_t + {}_4 \ln(Y/N)_t + u_t,$$

    C/M_2 –
M2 (0/   2); TW –   ; WS/Y –   -
                    ; R –   ,   -
            ; Y/N –   .   ,
    ${}_1 > 0;$ ${}_2 > 0;$ ${}_3 < 0;$ ${}_4 > 0.$ -
                                            .   -
            M0   M2 –[1]   ,   -
        .   0   2   -
            ,   ,   -
                , ,   ,   .

[20] (56%   ),

25

[30] (14,3% 2000 .), [23] (4–6%), [31]
(13%), [8] (31%) .

, , - -
, ,
, - , -
. - , -
, -
.
[11; 13; 35].

, , -
(
, ,);
-
, -
; -
. -

, -
-
. -

. -

, , ,
, − -
. -
, -
(-
, -
) .

-
. -

.

[7; 11; 24; 25;   .].

-

[24].

[7]   ,

,

12%   1989 .   .   [7]   ,

.   ,

.

,   -

[38].

–   .

-

$$Total_{GDP} = \frac{1}{} ElectricityConsumption,$$

$Total_{GDP}$ –   , %; $ElectricityConsumption$ –
, %. $Total_{GDP}$ -
$Total_{GDP}$,   -
, $Total_{GDP}$.   -
-

$(Total_{GDP} – Official_{GDP})$.

-

-

. -   ,   -

.   -

,

(,   -   ),

. -   ,

-

. -   ,

-

,   .   -

,   [27; 28],   -

93   ,   ,   60%

,   G6

,   ,

,

.

.   —

,   «   »   ,

.

,   .

[36]   .

,

,

.

-   ,

,   [18].

,   ,

,   .

$(I_1$

$I_2),$ *.

:   ,   ,   ,   ,
(VL, L, N, H, VH).

[18].

.

-

·

-

,   «   -

»   ,

,

·

,

·   ,

,

·

,   -

-

·

-

·   -

-   -

·   ,

-

,   ·

(MIMIC)   [15–17; 37].

24   –   -

·   MIMIC

,   -

,   ,   -

,   ,   -

, ,   ,   -

,   ·   -

-

,   MIMIC (,   ·   )   ·

y R^p x R^q

·

Причины η^{t-1} Индикаторы

X_1^t ┌─────────────────┐ Y_1^t

X_2^t │ Динамика развития │ Y_2^t

      │ теневой экономики │

      │ η^t │

X_i^t └─────────────────┘ Y_l^t

MIMIC

: [33]

(   )   -

:

$$y_t = \quad_t + \quad_t ,$$
$$_t = \quad x_t + \quad_t ,$$

R^q $R^p -$; R^q $R^p -$ -

      $= \mathrm{diag}\,(\quad_1, \ldots,$

$_p)$.   -

:

$$y_t = \quad x_t + v_t,$$
$= \quad v_t \sim N(0, \quad)\,(\quad = \quad + \quad).$

.   -   ,

.   .   [19]   , $_1$ -

.   ):   (

$$= \begin{matrix} 1 \\ _2 \end{matrix}, \quad = \quad_2 \quad = \begin{matrix} _1 & 0 \\ 0 & _2 \end{matrix},$$

$$y_{1t} = \quad x_t + v_{1t}$$
$$y_{2t} = \quad_2 \, x_t + v_{2t} ,$$

$$\mathrm{var} \begin{matrix} v_{1t} \\ v_{2t} \end{matrix} = \begin{matrix} \quad + \quad_1 & \quad_2 \\ \quad_2 & \quad_2^2 + \quad_2 \end{matrix} .$$

:

$$y_{2t} - {}_2 y_{1t} = v_{2t} - {}_2 v_{1t} = u_t.$$

:

$$\begin{aligned} y_{1t} &= {}x_t + v_{1t} \\ y_{2t} &= {}_2 y_{1t} + u_t \end{aligned},$$

$$\mathrm{var} \begin{array}{c} u_t \\ v_{1t} \end{array} = \begin{array}{cc} {}^2_2{}_1 + {}_2 & -{}_2{}_1 \\ -{}_2{}_1 & {}_1 \end{array}.$$

$_2$ · -

:

$$\begin{aligned} {}_1 &= -\mathrm{cov}(u_t, v_{1t}) / {}_2, \\ {}_2 &= \mathrm{var}(u_t) - {}^2_2{}_1, \\ &= \mathrm{var}(v_{1t}) - {}_1. \end{aligned}$$

MIMIC -

[9; 29]   –   -

.   ,

[22; 32],   –   [2; 3].

,

,   ,   ,   -

.

,

.   MIMIC

:

,   -

;   -

,   ;

«   » «   »   .

,   MIMIC

-

31

-
, . MIMIC
-

.

* * *

,

, -
, , MIMIC. -
-
, . -

. -
, ,
,
.

1. . ., . ., . .
// . –
2004. – 4. – . 18–31.
2. . ., . . :
// : . – 2018. –
1. – . 191–216.
3. . ., . ., . . . -
: MIMIC- // : -
. – 2017. – 1. – . 164–189.
4. . ., . . : -
// . – 2005. – 1. – . 39–53.
5. ., ., . -
: // : . 1997 .:
. – ., 1998. – . IV. – . 232–247.
6. . ., . ., . . -
// . – 2016. –
15. – . 20–33.
7. *Alexeev M., Pyle W.* A note on measuring the unofficial economy in the former
Soviet republics // Economics of Transition. – 2003. – No. 11 – P. 153–175.
8. *Bagachwa M., Naho A.* Estimating the second economy in Tanzania // World
Development. – 1995. – No. 23 (8). – P. 1387–1399.

9. *Bühn A., Schneider F.* Size and development of tax evasion in 38 OECD countries: What do we (not) know? // Journal of Economics and Political Economy. KSP Journals. – 2016. – Vol. 3 (1). – P. 1–11.

10. *Cagan P.* The demand for currency relative to the total money supply // Journal of Political Economy. – 1958. – No. 66 (3). – P. 302–328.

11. *Exploring* the Underground Economy: Studies of Illegal and Unreported Activity / Ed. by S. Pozo. – Kalamazoo, MI: W.E. Upjohn, Institute for Employment Research, 1996. – 184 p.

12. *Choi J.P., Thum M.* Corruption and the shadow economy // International Economic Review. – 2005. – Vol. 46, Iss. 3. – P. 817–836.

13. *Feige E.L.* A re-examination of the «underground economy» in the United States // IMF Staff Papers. – 1986. – No. 33 (4). – P. 768–781.

14. *Feige E.L.* How big is the irregular economy? // Challenge. – 1979. – No. 22 (1). – P. 5–13.

15. *Frey B.S., Weck H.* Bureaucracy and the shadow economy: A macro-approach // Anatomy of Government Deficiencies / Ed. by H. Hanusch. – Berlin: Springer, 1983. – P. 89–109.

16. *Frey B.S., Weck H.* Estimating the shadow economy: A «naive» approach // Oxford Economic Papers. – 1983. – No. 35. – P. 23–44.

17. *Frey B.S., Weck H.* The hidden economy as an «unobserved» variable // European Economic Review. – 1984. – No. 26/1. – P. 33–53.

18. *Giles D.E.A., Draeseke R.* A Fuzzy Logic Approach to Modelling the Underground Economy / Econometric Working Paper EWP9909, Department of Economics, University of Victoria. –1999. – 7 p.

19. *Giles D.E.A., Tedds L.M.* Taxes and the Canadian Underground Economy. – Toronto: Canadian Tax Foundation, 2002. – 270 p.

20. *Guissarri A.* La Demanda de Circulante y la Informalidad en la Argentina: 1930 – 1983. Seminarios ITDT. – 1986.

21. *Gutmann P.M.* The subterranean economy // Financial Analysts Journal. – 1977. – No. 34 (1). – P. 24–27.

22. *Herwartz H., Tafenau E., Schneider F.* One share fits all? Regional variations in the extent of the shadow economy in Europe // Regional Studies: The Journal of the Regional Studies Association. – 2015. – Vol. 49, No. 9. – P. 1575–1587.

23. *Isachsen A., Strom S.* The size of the hidden economy in Norway // Review of Income and Wealth. – 1985. – Vol. 31, Iss. 1. – P. 21–38.

24. *Kaufmann D., Kaliberda A.* Integrating the Unofficial Economy into the Dynamics of Post Socialist Economies: A Framework of Analyses and Evidence / Policy Research Working Paper 1691. – Washington, D.C.: The World Bank, 1996.

25. *Lizzeri C.* Mezzogiorno in Controluce. – Naples: Enel, 1979.

26. *Medina L., Schneider F.* Shadow Economies Around the World: What Did We Learn Over the Last 20 Years? / IMF Working Papers 18/17, International Monetary Fund. – 2018.

27. *Narayan P.K., Narayan S., Popp S.* A note on the long-run elasticities from the energy consumption–GDP relationship // Applied Energy. – 2010. – No. 87 – P. 1054–1057.

28. *Narayan P.K., Popp S.* The energy consumption–real GDP nexus revisited: Empirical evidence from 93 countries // Economic Modelling. – 2012. – Vol. 29, Iss. 2. – P. 303–308.

29. *Schneider F.* The Shadow Economy and Work in the Shadow: What Do We (Not) Know? / IZA Discussion Papers 6423, Institute for the Study of Labor (IZA). – 2012.

30. *Schneider F., Bajada C.* The Size and Development of the Shadow Economies in the Asia-Pacific / Working Paper No. 0301, Department Of Economics, Johannes Kepler University Linz. – 2003.

31. *Schneider F., Enste D.* Shadow economies: size, causes, and consequences // Journal of Economic Literature. – 2000. – No. 38 (1). – P. 77–114.

32. *Tafenau E., Herwartz H., Schneider F.* Regional estimates of the shadow economy in Europe // International Economic Journal. – 2010. – No. 24 (4). – P. 629–636.

33. *Tanzi V.* The Underground Economy in the United States and Abroad. – Lexington, Mass.: D.C. Heath & Co., 1982.

34. *Tanzi V.* The underground economy in the United States: annual estimates, 1930–1980 // IMF-Staff Papers. – 1983. – No. 30 (2). – P. 283–305.

35. *Thomas J.J.* Quantifying the black economy: «measurement without theory» yet again? // The Economic Journal. – 1999. – No. 109 (456). – P. 381–389.

36. *Vorobyev P.* Estimating Informal Economy Share in Russian Regions / EERC Working Paper No. E15/02. – 2015. – 44 p.

37. *Weck H.* Schattenwirtschaft: Eine Moglichkeitzur Einschrankung der offent-lichenVerwaltung? Eineokonomische Analyse. – Frankfurt/Main: Lang, 1983. – 160 p.

38. *Westin P.* Emerging from the Shadow: Special Topics in Russian Economy. – Aton Capital Group, 2002.

(,   ) –   -
                          ,   -

(630090,   ,   .   .   ,   17,   e-mail: andrey.v.kostin@gmail.com);

                                                           (630090,   -
              ,   .   , 2).

A.V. Kostin

METHODS OF MEASURING THE SHADOW ECONOMY AT THE REGIONAL LEVEL

Studies show that the share of the shadow economy in Russian regions varies between 11 and 85 percent. Large economic differentiation at the regional level keeps the problem of choosing methods for measuring the shadow economy current. While there is a fairly large number of studies on measuring the shadow economy at the country level, it is not enough at the regional one. Moreover, it is impossible to use all methods for the regional level without adjusting. The article considers methods of measuring the shadow economy through the prism of their potential applicability to evaluating the hidden gross regional product. We point out that the most often used methods for measuring the shadow economy at the regional level are the balance, the electricity consumption, and the MIMIC methods. The monetary method appeared to be not applicable at the regional level; the method of fuzzy sets was not applied to regions but has a high potential if the internal evaluation mechanisms are fundamentally refined.

Keywords: methods of measuring the shadow economy; regional economy; balance method; monetary method; MIMIC method; dynamics of the shadow economy

References

1. *Eliseeva, I.I., A.N. Shchirina & E.B. Kapralova*. (2004). Opredelenie obyema tenevoy deyatelnosti na osnove makroekonomicheskikh pokazateley [Defining the amount of the shadow business with macroeconomic indicators]. Voprosy statistiki [Problems of Statistics], 4, 18–31.

2. *Kireenko, A.P. & E.N. Nevzorova*. (2018). Tenevaya ekonomika v regionakh Rossii: vklad gorodskoy i selskoy mestnosti [Shadow economy in Russian regions: urban and rural areas contributions]. Region: ekonomika i sotsiologiya [Region: Economics and Sociology], 1, 191–216.

3. *Kireenko, A.P., E.N. Nevzorova, E.N. Orlova et al*. (2017). Tenevaya ekonomika v regionakh Rossii: otsenka na osnove MIMIC-modeli [Shadow economy in Russian regions: an estimation with the MIMIC model]. Region: ekonomika i sotsiologiya [Region: Economics and Sociology], 1, 164–189.

4. *Kuklin, A.A. & G.A. Agarkov*. (2005). Tenevaya ekonomika regiona: osobennosti proyavleniya i metody diagnostiki [Shadow economy in the region: features displays and methods of diagnosis]. Ekonomika regiona [Economy of Region], 1, 39–53.

5. *Nikolaenko, S., Ya. Lissovolik & R. MacFarquhar.* (1998). Tenevaya ekonomika v rossiyskikh regionakh. Obzor ekonomiki Rossii. Osnovnye tendentsii razvitiya. 1997 g. IV: Per. s angl [The Shadow Economy in Russia's Regions. Russian Economy Review. Major Development Trends. 1997. IV: Transl. from English]. Moscow, 232–247.

6. *Fedotov, D.Yu., E.N. Nevzorova & E.N. Orlova.* (2016). Nalogovyy metod rascheta velichiny tenevoy ekonomiki rossiyskikh regionov [A tax method to calculate the value of the shadow economy of Russian regions]. Finansy i kredit [Finance and Credit], 15, 20–33.

7. *Alexeev, M. & W. Pyle.* (2003). A note on measuring the unofficial economy in the former Soviet Republics. Economics of Transition, 11, 153–175.

8. *Bagachwa, M. & A. Naho.* (1995). Estimating the second economy in Tanzania. World Development, 23 (8), 1387–1399.

9. *Bühn, A. & F. Schneider.* (2016). Size and development of tax evasion in 38 OECD countries: What do we (not) know? Journal of Economics and Political Economy, KSP Journals, 3 (1), 1–11.

10. *Cagan, P.* (1958). The demand for currency relative to the total money supply. Journal of Political Economy, 66 (3), 302–328.

11. *Pozo, S.* (Ed.) (1996). Exploring the Underground Economy: Studies of Illegal and Unreported Activity. Kalamazoo, MI, W.E. Upjohn, Institute for Employment Research, 184.

12. *Choi, J.P. & M. Thum.* (2005). Corruption and the shadow economy. International Economic Review, Vol. 46, Iss. 3, 817–836.

13. *Feige, E.L.* (1986). A re-examination of the «underground economy» in the United States. IMF Staff Papers, 33 (4), 768–781.

14. *Feige, E.L.* (1979). How big is the irregular economy? Challenge 22 (1), 5–13.

15. *Frey, B.S., H. Weck & H. Hanusch* (Ed.). (1983). Bureaucracy and the shadow economy: A macro-approach. Anatomy of Government Deficiencies. Berlin, Springer, 89–109.

16. *Frey, B.S. & H. Weck.* (1983). Estimating the shadow economy: A «naive» approach. Oxford Economic Papers, 35, 23–44.

17. *Frey, B.S. & H. Weck.* (1984). The hidden economy as an «unobserved» variable. European Economic Review, 26/1, 33–53.

18. *Giles, D.E.A. & R. Draeseke.* (1999). A fuzzy logic approach to modelling the underground economy. Econometric Working Paper EWP9909, Department of Economics, University of Victoria, 7.

19. *Giles, D.E.A. & L.M. Tedds.* (2002). Taxes and the Canadian underground economy. Canadian Tax Foundation. Toronto, 270.

20. *Guissarri, A.* (1986). La demanda de circulante y la informalidad en la Argentina: 1930 – 1983. Seminarios ITDT.

21. *Gutmann, P.M.* (1977). The subterranean economy. Financial Analysts Journal, 34:1, 24–27.

22. *Herwartz, H., E. Tafenau & F. Schneider.* (2015). One share fits all? Regional variations in the extent of the shadow economy in Europe. Regional Studies, The Journal of the Regional Studies Association, Vol. 49, No. 9, 1575–1587.

23. *Isachsen, A. & S. Strom.* (1985). The size of the hidden economy in Norway. Review of Income and Wealth, Vol. 31, Iss. 1, 21–38.

24. *Kaufmann, D.* & *A. Kaliberda*. (1996). Integrating the unofficial economy into the dynamics of post socialist economies: A framework of analyses and evidence. Policy Research Working Paper 1691. Washington, D.C., The World Bank.

25. *Lizzeri, C*. (1979). Mezzogiorno in Controluce. Naples, Enel.

26. *Medina, L.* & *F. Schneider*. (2018). Shadow economies around the world: What did we learn over the last 20 years? IMF Working Papers 18/17, International Monetary Fund.

27. *Narayan, P.K., S. Narayan* & *S. Popp*. (2010). A note on the long-run elasticities from the energy consumption–GDP relationship. Applied Energy, 87, 1054–1057.

28. *Narayan, P.K.* & *S. Popp*. (2012). The energy consumption–real GDP nexus revisited: Empirical evidence from 93 countries. Economic Modelling, Vol. 29, Iss. 2, 303–308.

29. *Schneider, F*. (2012). The Shadow Economy and Work in the Shadow: What Do We (Not) Know? IZA Discussion Papers 6423, Institute for the Study of Labor (IZA).

30. *Schneider, F*. & *C. Bajada*. (2003). The Size and Development of the Shadow Economies in the Asia-Pacific. Working Paper No. 0301, Department of Economics, Johannes Kepler University Linz.

31. *Schneider, F*. & *D. Enste*. (2000). Shadow economies: size, causes, and consequences. Journal of Economic Literature, 38 (1), 77–114.

32. *Tafenau, E., H. Herwartz* & *F. Schneider*. (2010). Regional estimates of the shadow economy in Europe. International Economic Journal, 24 (4), 629–636.

33. *Tanzi, V*. (1982). The Underground Economy in the United States and Abroad. Lexington, Mass., D.C. Heath & Co.

34. *Tanzi, V*. (1983). The underground economy in the United States: annual estimates, 1930-1980. IMF-Staff Papers, 30 (2), 283–305.

35. *Thomas, J.J*. (1999). Quantifying the black economy: «Measurement without theory» yet again? The Economic Journal, 109 (456), 381–389.

36. *Vorobyev, P*. (2015). Estimation informal economy share in Russian regions. EERC Working Paper No. E15/02, 44.

37. *Weck, H*. (1983). Schattenwirtschaft: Eine Moglichkeitzur Einschrankung der offentlichen Verwaltung? Eineokonomische Analyse. Frankfurt/Main: Lang, 160.

38. *Westin, P*. (2002). Emerging from the shadow: Special Topics in Russian Economy. Aton Capital Group.

Information about the author

Kostin, Andrey Vladimirovich (Novosibirsk, Russia) – Candidate of Sciences (Economics), Senior Researcher at the Institute of Economics and Industrial Engineering, Siberian Branch of the Russian Academy of Sciences (17, Ac. Lavrentiev av., Novosibirsk, 630090, Russia, e-mail: andrey.v.kostin@gmail.com); Associate Professor at Novosibirsk National Research State University (2, Pirogov st., Novosibirsk, 630090, Russia).

06.06.2018 .

© 	. ., 2018