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ON NET EXTERNAL ASSETS IN REGIONS AND STATES OF THE U.S.A.

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Abstract:
We present rough estimates of net external assets for 8 regions and 51 states of the United States. These estimates have been derived from the data on gross state product and state personal income. We identify the largest creditors and debtors and observe relatively important disparities in net external assets across the states and regions. The analysis is also focused on various trends in the indebtedness of regional economies. Using the correlation matrices for selected base years, the degree of capital mobility across regions and states is quantified. We provide some evidence that states are more open to capital flows than regions. In the end, the convergence of net external assets between 1980 and 2000 is confirmed.

Keywords: capital movements, correlation matrices, net external assets, regions and states of the U.S.A.

JEL Classification: C82, F41, R10

1. Introduction

Net external assets (NEA) and the current account (CA) of the balance of payments constitute fundamental macroeconomic variables. NEA measure the position of an economy on the world credit market, while CA indicates the change of this position over time. If expressed relative to GDP (the gross domestic product), NEA differ substantially across economies. Developed countries are both net lenders (Japan; Switzerland) and net debtors (Australia, Canada, the United States). Developing countries are typically net debtors. Oil exporting countries are frequently strong net creditors.

Sinn (1990) provided balance-sheet estimates of NEA and NEA/GDP for a large number of countries in 1970–1987. These estimates were the consolidated NEA of the central bank, deposit money banks, private households and firms, and public authorities. Some NEA data (the international investment position) are available from the *International Financial Statistics* of the International Monetary Fund. Duczynski (2000) computed rough NEA estimates for 113 countries in 1990 using the cumulated CA in 1970–1990 and also rough NEA estimates for U.S. states in 1977, 1982, 1987, and 1992 from the data on gross state product (GSP) and state personal income (SPI).

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These data are presented in the *Survey of Current Business* and on the web site of the U.S. Department of Commerce, Bureau of Economic Analysis, http://www.bea.gov. NEA were also examined by Lane and Milesi-Ferretti (2001). They constructed estimates of external assets and liabilities for 67 industrial and developing countries. Among other things, they studied trends in NEA and shifts in debt-equity ratios over time.

It should be noted that there already exists some research on the flows of capital among U.S. states. Kalemli-Ozcan *et al*. (2005) study the determinants of capital flows across U.S. states. They analyse a simple neoclassical model and observe high capital mobility among the states.

The present paper discusses some aspects of NEA for 8 regions and 51 states of the United States in the 1980–2000 period. It identifies the largest creditors and debtors and tries to shed light on the trends in capital movements across the states. Using correlations of NEA for selected base years, we can provide some information concerning the degree of capital mobility among the states. We also examine the regional current account and the convergence of NEA.

2. The Construction of Net External Assets

This contribution presents some estimates of NEA for states and regions of the United States. A full database of annual observations for the 1977–2001 period is available in a PDF file at the Internet address http://duczynski.czweb.org, where NEA-to-GSP ratios are expressed in percentage terms. The computation of NEA uses estimates of received property income (derived from SPI) and produced property income (derived from GSP). The received property income consists of the estimate of net interest, rental income of persons, proprietors' income, and the estimate of corporate profits. SPI does not directly contain net interest, nor does it contain corporate profits. Nevertheless, SPI contains personal interest income and personal dividend income. We obtained the estimate of net interest from the personal interest income using the ratios of these variables at the U.S. level. The ratios of net interest to personal interest income at the level of the United States amounted to 0.70 in 1980, 0.64 in 1990, and 0.57 in 2000. The personal interest income exceeds the net interest: the personal interest income consists of the net interest, the interest paid by persons, and the government interest. With the given adjustment of the personal interest income to the net interest we got estimates of NEA in which the federal government debt was allocated to U.S. states.

We obtained the estimate of corporate profits from the personal dividend income (again with the use of the ratios of these variables at the U.S. level). The ratios of corporate profits to personal dividend income were 3.11 in 1980, 3.00 in 1990, and 2.10 in 2000.

The produced property income was derived from the property-type GSP. The property-type GSP contains the depreciation of capital. Estimates of capital depreciation for individual U.S. states are not available. The ratios of the produced property income (with no depreciation) to the property-type GSP at the U.S. level amounted to 0.64 in 1980, 0.67 in 1990, and 0.65 in 2000. These ratios for corresponding years were used in the construction of the estimates of the produced property income for individual regions and states.

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The computation of NEA for individual regions and states was based on the following formula (see Duczynski, 2000):

$$NEA/GSP = (R\text{-}1)K/GSP, \quad (1)$$

where R is the ratio of received to produced property income and K is the value of physical capital. We assume the same rate of return inside and outside each region and state. R is then the ratio of all assets to domestic physical capital. R-1 is then equal to the ratio of NEA to physical capital. The *Survey of Current Business* presents estimates of private physical capital (fixed reproducible tangible wealth) for the United States. We allocated physical capital to individual states in proportions to the property-type GSP. From (1) we obtained preliminary estimates of NEA/GSP. The given procedure was also applied to the United States as a whole and the resulting preliminary NEA estimates were compared to the estimates of NEA presented in the *International Financial Statistics* (2002). We computed differences between the NEA/GSP estimates from the *International Financial Statistics* and our preliminary estimates for the United States. We added the given differences to the preliminary estimates of NEA/GSP for individual regions and states. By this relatively small correction we got aggregate-consistent estimates of NEA/GSP for regions and states – the sum of NEA across states or regions should correspond to the overall position of the United States.

The final estimates of NEA/GSP for 8 regions and 51 states are presented in Table 1. Regions are denoted by boldface italics. The computation of NEA involved numerous approximations; consequently, the given estimates are only rough estimates.

Table 1
Net External Assets in Relation to Gross State Product (in %) for Regions and States of the United States

***Region* or state / year**	**1980**	**1985**	**1990**	**1995**	**2000**
U.S.A.	13	2	-3	-6	-22
New England	96	41	24	19	-15
Connecticut	140	63	33	21	-8
Maine	81	57	47	17	10
Massachusetts	79	26	12	19	-11
New Hampshire	73	39	52	12	-53
Rhode Island	73	37	10	3	-68
Vermont	100	73	43	56	33
Mideast	55	25	17	10	-16
Delaware	39	-38	-69	-66	-115
District of Columbia	6	0	-26	-25	-28
Maryland	51	21	3	12	0
New Jersey	76	40	22	16	-18
New York	61	13	9	10	-18
Pennsylvania	54	48	51	16	-7
Great Lakes	28	7	11	2	-7
Illinois	33	21	19	12	8
Indiana	15	0	-6	-29	-26
Michigan	55	11	36	29	3

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Ohio	8	-9	-7	-16	-28
Wisconsin	23	8	3	-2	0
Plains	-3	13	10	-8	2
Iowa	-29	15	-5	-27	-10
Kansas	-10	-5	1	6	-7
Minnesota	0	-2	5	2	19
Missouri	45	38	24	-3	-11
Nebraska	-14	20	14	-20	7
North Dakota	-153	-16	10	-14	18
South Dakota	-22	-10	11	-66	13
Southeast	-8	-9	-8	-19	-18
Alabama	-44	-41	-32	-36	-37
Arkansas	-33	-8	-28	-44	-21
Florida	183	121	124	83	84
Georgia	-32	-43	-33	-47	-41
Kentucky	-25	-31	-36	-59	-45
Louisiana	-201	-138	-141	-120	-87
Mississippi	-79	-74	-55	-68	-40
North Carolina	-33	-34	-55	-39	-64
South Carolina	-17	-16	-40	-48	-39
Tennessee	-17	-25	-19	-33	-47
Virginia	18	4	-15	-10	-28
West Virginia	-56	-34	-26	-45	-38
Southwest	-84	-46	-39	-32	-39
Arizona	48	37	38	-12	-28
New Mexico	-101	-74	-18	-86	-113
Oklahoma	-62	-36	-19	-12	2
Texas	-104	-59	-56	-34	-41
Rocky Mountain	-38	-15	-4	-6	-7
Colorado	12	16	23	16	15
Idaho	-8	18	31	-15	-19
Montana	-48	17	53	41	42
Utah	-52	-49	-47	-36	-64
Wyoming	-211	-155	-151	-105	-29
Far West	26	-3	-27	-7	-28
Alaska	-298	-281	-251	-132	-126
California	42	7	-27	-8	-26
Hawaii	0	-31	-61	-1	-39
Nevada	-20	-26	-17	-29	-13
Oregon	18	20	21	-5	-60
Washington	36	24	9	23	-7

3. Distribution of Creditors and Debtors and Some Trends

Table 2 presents arithmetic averages of NEA in relation to GSP for selected time periods between 1981 and 2000. Regarding regions, based on the 1981–2000 indicators, New England and the Mideast were the largest creditors, whereas the Southwest and the

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Southeast were the most important debtors. Regarding states, again based on the 1981–2000 indicators, Florida, Vermont, Connecticut, Maine, and Montana were the strongest creditors, while Alaska, Louisiana, Wyoming, New Mexico, and Mississippi were the most important debtors. We observe great disparities in NEA/GSP for U.S. states. If we take a look at the full database of annual observations of NEA/GSP between 1981 and 2000, the 5 cases with the highest indebtedness are Alaska (1981, -283%; 1982, -345%; 1983, -301%; 1984, -276%; 1985, -281 %). The 5 cases with the strongest creditor position are Florida (1981, 172%; 1982, 140%; 1983, 147%; 1989, 125%) and Connecticut (1981, 136 %).

As far as some trends in inter-regional capital movements are concerned, we observe a strong capital inflow into New England (NEA/GSP – in percentage points - declined by 107 between 1981 and 2000) and a relatively important capital outflow from the Southwest (between 1981 and 2000 NEA/GSP grew by 45 in percentage points). Regarding states, the strongest capital inflow is observed for Connecticut (-144), Rhode Island (-134), Delaware (-126), New Hampshire (-122), and Oregon (-97). The most important capital outflow is observed for Wyoming (+181), Alaska (+157), North Dakota (+120), Montana (+93), and Louisiana (+91). Changes in NEA/GSP (in percentage points) are in parentheses. These are really large numbers. We can infer that physical capital is highly mobile across the states.

Table 2
Arithmetic Averages of Annual Net External Assets in Relation to Gross State Product (in %) for Regions and States of the United States

***Region* or state / period**	**1981-85**	**1986-90**	**1991-95**	**1996-2000**	**1981-2000**
U.S.A.	6	0	-4	-15	-3
New England	66	27	20	-3	28
Connecticut	96	41	23	1	40
Maine	63	44	34	16	39
Massachusetts	51	11	12	-3	18
New Hampshire	58	41	26	-31	23
Rhode Island	59	24	2	-29	14
Vermont	78	53	45	42	54
Mideast	38	16	10	-8	14
Delaware	-9	-54	-68	-96	-57
District of Columbia	3	-12	-26	-28	-16
Maryland	34	4	6	5	13
New Jersey	58	23	14	-6	22
New York	28	6	8	-12	8
Pennsylvania	52	44	28	1	31
Great Lakes	16	7	6	-6	6
Illinois	34	16	14	6	18
Indiana	8	-8	-14	-28	-10
Michigan	15	21	28	9	18
Ohio	0	-8	-11	-25	-11
Wisconsin	16	8	-2	-1	5
Plains	14	14	1	-2	7
Iowa	13	17	-14	-16	0

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Kansas	1	7	3	1	3
Minnesota	2	2	4	9	4
Missouri	41	22	9	-11	15
Nebraska	22	30	-5	-3	11
North Dakota	-46	15	13	9	-2
South Dakota	4	4	-28	-3	-6
Southeast	-8	-10	-14	-17	-12
Alabama	-40	-38	-30	-37	-36
Arkansas	-26	-17	-41	-27	-28
Florida	141	117	97	86	110
Georgia	-38	-41	-43	-43	-41
Kentucky	-18	-36	-51	-53	-40
Louisiana	-160	-126	-104	-90	-120
Mississippi	-74	-61	-65	-47	-62
North Carolina	-30	-51	-50	-52	-46
South Carolina	-19	-41	-46	-43	-37
Tennessee	-20	-29	-32	-47	-32
Virginia	9	-6	-15	-25	-9
West Virginia	-41	-34	-36	-40	-38
Southwest	-66	-24	-33	-38	-40
Arizona	44	33	4	-20	15
New Mexico	-104	-23	-88	-96	-78
Oklahoma	-53	-8	-14	-8	-21
Texas	-82	-36	-38	-41	-49
Rocky Mountain	-24	0	-4	-5	-9
Colorado	16	22	15	12	17
Idaho	13	27	13	-3	12
Montana	-14	49	50	41	32
Utah	-51	-34	-40	-51	-44
Wyoming	-179	-133	-116	-48	-119
Far West	7	-15	-14	-19	-10
Alaska	-297	-222	-141	-125	-196
California	22	-12	-14	-18	-6
Hawaii	-23	-46	-27	-29	-31
Nevada	-26	-32	-30	-16	-26
Oregon	29	20	8	-39	4
Washington	25	13	13	5	14

The database of NEA/GSP shows relatively important dispersions of NEA among the states. The given database can be used in future research. For example, Duczynski and Tóthová (2002) show that rich U.S. states have a tendency to be net debtors, whereas in international comparisons rich countries are on average net creditors. The growth of NEA (the capital outflow) is negatively correlated with the product growth among U.S. states, while the given correlation is positive among countries. This is a certain indication that international capital flows may have been inefficient (a capital inflow was connected with slow product growth). It is likely that the capital flows across U.S. states were more efficient than international capital flows.

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We should also note that the present contribution analyses positions of the private sector in states and regions. In other words, we abstract from the positions of local governments. Fiscal positions of U.S. states are, for example, discussed in Bayoumi *et al*. (1995).

4. Correlation Matrices and the Degree of Capital Mobility

To learn more about the degree of capital mobility among the U.S. states, we present correlation coefficients of NEA/GSP for selected base years in Table 3. If capital were completely immobile, these coefficients would be equal to 1 (or very close to 1). Except for the diagonal elements, correlation coefficients fall short of 1, so capital is likely to be highly mobile. Nevertheless, since these coefficients are always positive, we observe some persistency in NEA/GSP across the states. Qualitatively similar results are obtained if we consider the correlation matrix for regions (Table 4). Many of the correlation coefficients are substantially below 1, so capital was likely to be highly mobile across the regions. We can also consider selected correlation matrices for shorter time periods (Tables 5-8). We focus on the initial and the final years of the period 1980–2000, so that we may assess the change in capital mobility. The results differ. Correlation coefficients in Tables 5 and 6 are close to 1, while many correlation coefficients in Tables 7 and 8 are substantially below 1. It is therefore possible that the degree of inter-state or inter-regional capital mobility increased from the early 1980s to the late 1990s.

Table 3
The Correlation Matrix for NEA/GSP and 51 U.S. States in Selected Base Years

Years	1980	1985	1990	1995	2000
1980	1.00	0.92	0.82	0.82	0.48
1985	0.92	1.00	0.95	0.88	0.66
1990	0.82	0.95	1.00	0.86	0.70
1995	0.82	0.88	0.86	1.00	0.74
2000	0.48	0.66	0.70	0.74	1.00

Table 4
The Correlation Matrix for NEA/GSP and 8 Regions in Selected Base Years

Years	1980	1985	1990	1995	2000
1980	1.00	0.95	0.75	0.92	0.32
1985	0.95	1.00	0.89	0.93	0.55
1990	0.75	0.89	1.00	0.85	0.76
1995	0.92	0.93	0.85	1.00	0.48
2000	0.32	0.55	0.76	0.48	1.00

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Table 5
The Correlation Matrix for NEA/GSP and 51 U.S. States in Shorter Periods

Years	1980	1981	1982	1983	1984	1985
1980	1.00	0.99	0.95	0.94	0.95	0.92
1981	0.99	1.00	0.98	0.97	0.97	0.94
1982	0.95	0.98	1.00	0.98	0.98	0.97
1983	0.94	0.97	0.98	1.00	0.99	0.98
1984	0.95	0.97	0.98	0.99	1.00	0.99
1985	0.92	0.94	0.97	0.98	0.99	1.00

Table 6
The Correlation Matrix for NEA/GSP and 8 Regions in Shorter Periods

Years	1980	1981	1982	1983	1984	1985
1980	1.00	0.99	0.97	0.97	0.99	0.95
1981	0.99	1.00	0.99	0.99	0.99	0.97
1982	0.97	0.99	1.00	0.99	0.99	0.99
1983	0.97	0.99	0.99	1.00	1.00	0.99
1984	0.99	0.99	0.99	1.00	1.00	0.99
1985	0.95	0.97	0.99	0.99	0.99	1.00

Table 7
The Correlation Matrix for NEA/GSP and 51 U.S. States in Shorter Periods

Years	1995	1996	1997	1998	1999	2000
1995	1.00	0.99	0.94	0.72	0.67	0.74
1996	0.99	1.00	0.94	0.72	0.67	0.74
1997	0.94	0.94	1.00	0.83	0.79	0.86
1998	0.72	0.72	0.83	1.00	0.98	0.96
1999	0.67	0.67	0.79	0.98	1.00	0.97
2000	0.74	0.74	0.86	0.96	0.97	1.00

Table 8
The Correlation Matrix for NEA/GSP and 8 Regions in Shorter Periods

Years	1995	1996	1997	1998	1999	2000
1995	1.00	0.99	0.98	0.32	0.31	0.48
1996	0.99	1.00	0.98	0.32	0.30	0.49
1997	0.98	0.98	1.00	0.42	0.41	0.56
1998	0.32	0.32	0.42	1.00	0.99	0.95
1999	0.31	0.30	0.41	0.99	1.00	0.95
2000	0.48	0.49	0.56	0.95	0.95	1.00

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5. The Regional Current Account

From the data on NEA/GSP, we can derive at least very rough estimates of the current-account ratios (CA/GSP) for regions and states. CA/GSP can be approximated by the difference of NEA/GSP between two subsequent years. In this way we computed CA ratios for the time intervals 1980–81, 1985–86, 1990–91, 1995–96, and 2000–2001. The degree of international (inter-regional) capital mobility can be approximated by the absolute value of the CA ratio. For the given time intervals, we computed arithmetic averages of absolute values of CA/GSP for states and regions. For 1980-81, we obtained 9.1% for states, 3.9% for regions, and 2% for the United States as a whole. For 1985–86, we got 16.5% for states, 10.5% for regions, and 0% for the United States. For 1990–91, we received 8.2% for states, 3.5% for regions, and 1% for the United States. For 1995–96, we got 4.8% for states, 2.3% for regions, and 1% for the United States. For 2000–2001, we obtained 10.8% for states, 7.9% for regions, and 4% for the U.S.A. Therefore, capital mobility tends to be higher for smaller economies – higher for states, lower for regions and the lowest for the U.S.A. as a whole. In economics we know that smaller economies have a tendency to be more open on average than larger economies. The present evidence supports this view.

6. σ-convergence and β-convergence

If the standard deviation of a variable in a sample decreases over time, we have σ-convergence. If the growth of a variable depends significantly negatively on the initial level of the given variable, we have β-convergence. It is well known in economics that σ-convergence implies β-convergence, while the opposite is not the case (see Barro and Sala-i-Martin, 1995). Barro and Sala-i-Martin (1991) examine the convergence of SPI and GSP among U.S. states. Here we follow this approach, focusing on NEA instead.

For 1980, the average NEA/GSP is -5.9% for states and 9.0% for regions. Standard deviations are 84.8% for states and 55.6% for regions. For 1985, the average NEA/GSP is -8.7% for states and 1.6% for regions. Standard deviations are 61.5% for states and 26.6% for regions. For 1990, the average is -10.5% for states and -2.0% for regions. Standard deviations of NEA/GSP are 57.5% for states and 22.0% for regions. For 1995, the average is -17.6% for states and -5.1% for regions. Standard deviations are 41.5% for states and 16.0% for regions. For 2000, the average NEA/GSP is -23.7% for states and -16.0% for regions. Standard deviations are 38.5% for states and 12.9% for regions. Since the arithmetic averages of NEA/GSP decline over time both for regions and states, we observe an average tendency towards capital inflows into regions and states. This is consistent with the fact that the United States as a whole were a net capital importer. Since the standard deviations uniformly and substantially decline over time, we have evidence for σ-convergence of NEA/GSP between 1980 and 2000.

To examine β-convergence, we regressed (using ordinary least squares) the change in NEA/GSP between 1980 and 2000 on the initial level of NEA/GSP:

$$\Delta(\text{NEA/GSP}) = (\text{NEA/GSP})_{2000} - (\text{NEA/GSP})_{1980} = \underset{(-4.68)}{-22.4\%} - \underset{(-13.76)}{0.781}\,(\text{NEA/GSP})_{1980} \qquad (2)$$

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The value of R^2 is 0.79, and t-statistics are in parentheses. Since this dependence is negative and strongly significant, we have good evidence for β-convergence, consistently with the fact that σ-convergence implies β-convergence. Figure 1 shows the dependence of $(NEA/GSP)_{2000}$ on $(NEA/GSP)_{1980}$. This dependence is positive. Figure 2 presents the dependence of $\Delta(NEA/GSP)$ on $(NEA/GSP)_{1980}$. This dependence is negative.

7. Conclusion

Using the data on gross state product (GSP) and state personal income (SPI), we constructed rough estimates of net external assets (NEA) for 8 regions and 51 states of the United States. The present paper shows some of these data in 1980–2000. A full database of annual observations of NEA relative to GSP for the 1977–2001 period is available at the Internet address http://duczynski.czweb.org. We identified the largest creditors and debtors and some trends in capital movements across the regions and states. Correlation coefficients of NEA/GSP in two different years were proposed as a measure of capital mobility among regions or states. We were able to construct at least very rough estimates of the regional current account and infer that capital mobility was on average higher for states (smaller economies) than for regions. We also provided evidence for the σ-convergence and β-convergence of NEA between 1980 and 2000. Future research could use the given database of NEA and could extend it for more recent years. Alternatively, future research could focus on capital movements among other regional economies, such as Canadian provinces, Japanese prefectures, or Western European regions.

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Appendix:

Figure 1
The dependence of Net External Assets in 2000 on Net External Assets in 1980 for 51 U.S. States

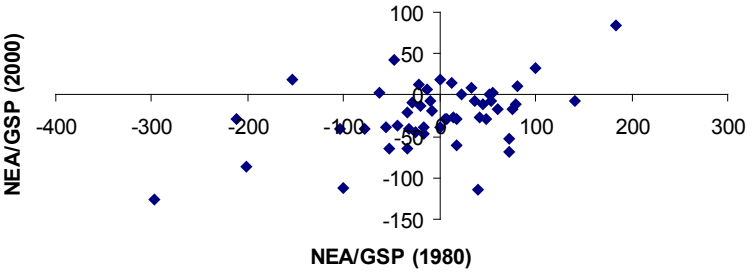

Figure 2
The Dependence of the Change in Net External Assets betveen 1980 and 2000 on the Initial Value