



Sketch of Elements of a Measurement Theory of Economics as an Extension of the Current Sequence of SNA Manuals

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Sketch of elements of a measurement theory of
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Abstract

Progress in developing ever more relevant manuals of national accounts seems to this author to require an overarching vision. This paper presents elements of such a vision.

Scalability and precision are important in several senses: Questions of how to measure a(-ny) given economic phenomenon at its associated appropriate "scale" (micro versus macro, or time scale), as well as constructively pointing out how to develop quantified descriptions of uncertainties of specific measures, and other relevant questions should be able to be

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handled within such a visionary framework. The framework should also enable economic theorists (to be challenged) to define their concepts sufficiently precisely (within the framework) for falsification to be conceivably within reach of empirically working economists.

Teach-ability of the measurement theory is important: The current SNA manuals are so voluminous that most economists actually are quite SNA-illiterate. Being the main conceptual bridge between macroeconomic theories and empirical studies this has boded ill for the division of labor among economists as a group. The envisioned framework needs to be helpful in remedying this sad state of affairs also. A limited number of "principles" which guides classifications and NA-analysis of (the elements of) a given economic phenomenon to arrive at the recommended NA-representation would enable students to learn the measurement theory (and the SNA) more effectively.

The reasonable requirements are many. The challenge needs to be met if the reputation of having a can-do ability of economists is to be regained.

The paper proposes sketches of many of the elements of such a framework of measurement theory of economics. Taken together a vision emerges.

1 Introduction

The NA form the core of comprehensive statistics on the state of the economy, especially for economists. The Great Recession of 2008 onwards came with very few exceptions as a surprise to the economics community. One line of reactions was reconsidering whether National Statistical Institutes (NSIs) were producing statistics on all the appropriate aspects of the economy. Many initiatives have been suggested and some have led to gathering data for new statistics, e.g. on globalization. More focus has been given to measuring the *expectations* of future prices, e.g. of dwelling by households.

On a deeper level we need to reconsider whether we have restricted our focus too narrowly to create the current NA manuals and statistics instead of broadening the scope and developing the measurement tools of economists more broadly and generally.

One complaint from some groups of academically active economists is that the figures of the NA are irrelevant to their research. To the present paper's author this is also *our* problem (as measurement economists), not just *their* problem. If we can not provide them with a useful general measurement tool can we blame them for ignoring all the specialized measurement tools we have developed in the syllabi they control?

In order to (become and) stay relevant with most economists we need to broaden the scope of the measurement tools we are developing.

Opening a discussion on how to create a measurement theory of Economics we need to define our point of departure and in which direction the discussion should proceed. Quoting Reich (2001, p. 130): "The appearance of the 1993 SNA was quite a historical achievement that was equal to the arrival of the microeconomic equilibrium model. The national accounts have become like a bible, the concepts and methods of observation having developed to the stage

of routine and rigor" This paper's author fully agrees that the SNA1993 was important and now the SNA2008 is. Despite their highly readable and systematic qualities, complicating compromises abound, making it difficult to extract the essence and eliminate the consequences of practicalities perhaps relevant at the time of writing, but not necessarily in the future. The discussion in the present paper is from the point of view of people working on compiling the national accounts. Not from a particular philosophical position, nor from a particular methodological position.

Any manual of national accounts needs to strike a balance between clarity of concept and principles on one hand, the increasing complexities of assets, products and institutions (as economies develop) on the second hand, measurability within established, relatively objective methods on the third hand, and cross-country feasibility on the fourth hand. As any one of these dimensions change, the manuals, as we know them, are bound to change in adaptation. This is pushing the SNA-manuals in an unsustainable direction (from the perspective of the occasional research user), ever increasing in complexity. Isn't it so that we have already lost most of our audience outside of the NA compilers and manual writers?

The present SNA, as it is, caters to the needs of the compilers. Let's focus on usefulness for the occasional research user. It seems an even higher degree of simplicity of principles, logic and clarity within a relatively brief text is needed. Fundamentally this paper attempts to form a vision which is an extension of the SNA, in ways which the text have suggested explicitly or perhaps just implicitly by this author's reading of it. The measurement problems of all economists should eventually be addressed.

The rest of the paper should have been organized around the four main themes:

1. *Define the essential descriptive records of a virtual database.* Establish the fundamental structure of all records of economic facts (actions, states of affairs, etc.), and systematic methods to reduce an economic phenomenon¹ to a set of such records. Only what is in principle observable is admitted here.
2. *Characterization of the components of uncertainty of NA-figures* used for a particular purpose.
3. *How to relate economic theories to observable phenomena, and find the relevant observations to inform an economic analysis.* How to extend the scope of the economic measurement theory to go beyond the NA-manuals. Here we deal with using the insights from NA manuals to inform measurements of economic concepts more generally.
4. *Reworking the manual to extract its essence of core accounting concepts and principles, and simpler ways to present the consequences of the set of complications arising from limitations of various kinds from different sources.* Here I would have liked to discuss in what ways the massive contents of the SNA manual may be reduced to a set of “pure” principles and concepts, some classifications, and a set of rules for applying these.

¹Here I adopt a term from Aukrust (1955).

2 A Measurement theory for Economics (MTE)?

Which questions should an MTE address?

How to measure economic phenomena in ways which are relevant to Economics both as a scientific and as a policy oriented endeavor?

What kinds of measurement are available and how do the figures produced by different methods compare?

2.1 Today

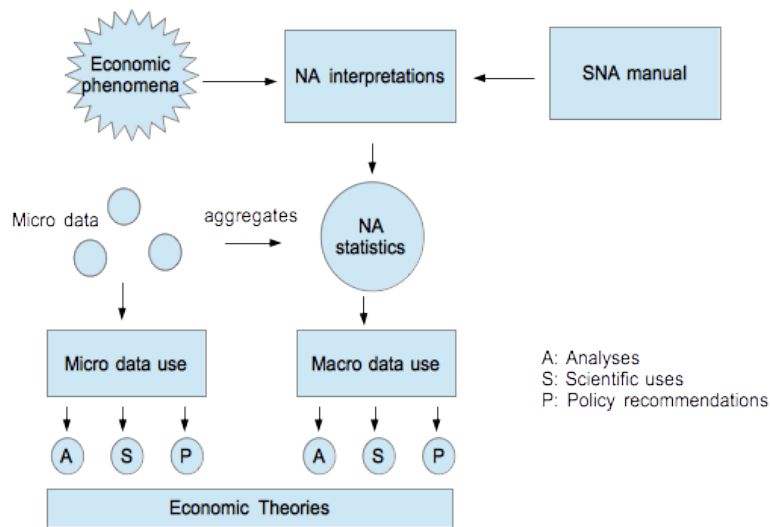


Figure 1. Present NA measurement setup

The illustration captures the current situation. The NA-system as a measurement system produces macro figures (NA statistics) from the economic phenomena, through a set of country specific NA-interpretations. Those macro figures are the basis on which macro economic policy advice rests. For micro economic policy advice an entirely different source of data is needed.

Scalability Once a schematic matrix-like mode of presentation and data storage has been found, compilers work on estimates of the target sums, i.e. the sums which the various breakdowns have to respect. This way the focus is on the intermediate or “meso” level of national accounts, i.e. NA-industries, NA-product(categorie)-s, and NA-asset categories. How the individual institutional units or kind-of-activity-units (kau’s) are represented is in practice not given as much consideration. This “locks-in” the addressable level of scale for the figures produced by this measurement process. In effect this reflects choices of the NSI which among other things has a tight budget constraint to consider.

Another dimension where scalability may be important is Time. Currently the SNA has “built-in” preferences for annual and quarterly periods, despite the assertion in SNA2008, §18.33:

“In principle, the SNA may be applied to any length of time period, but there are some special considerations that need to be respected for high frequency as opposed annual accounts,”

reference is given to another manual and handbook on the topic of quarterly accounts.

2.2 A first look

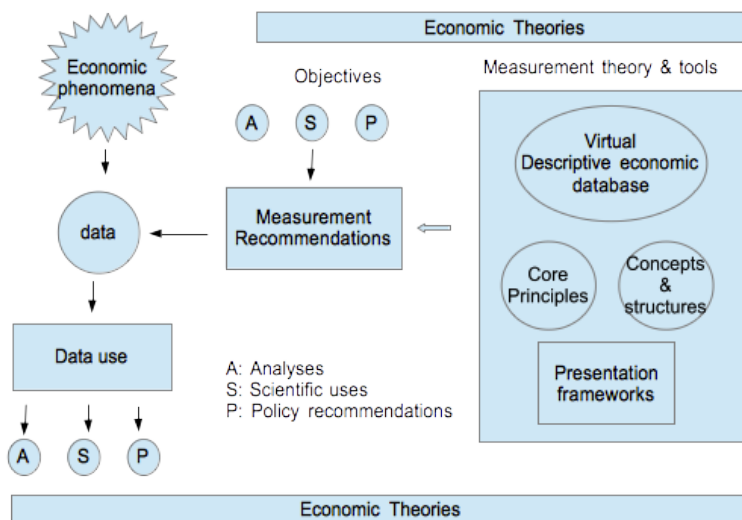


Figure 2. Universal economic measurement theory

The illustration captures a future situation which may be realized pursuing a vision such as the one presented in this paper.

The envisioned extended NA-system as a measurement system produces figures at *all* levels from the economic phenomena, through a set of *universal* measurement recommendations and conceptual interpretations - which may depend on the specific measurement objectives.

Those figures are able to inform economic policy advice at all levels of detail (macro, meso, micro and sub-micro). Also it becomes easier to determine the relevant observations to put theoretical concepts, models and structures to empirical tests, by determining non-empty sets of compatible data, incompatible data and critical observations/data. This should make the measurement system quite appropriate as a basis from which to articulate some properties of mismatch between the figures used with specific models and the data needed to either illustrate the model's empirical strength, or its irrelevance. Embracing

skeptics and promoting a healthy discussion of pros and cons of theories and the data proposed for theoretical (in-) compatibility and measurement suggestions behind policy proposals.

Scalability Here the tools are available and appropriate for the macro level, the meso level as well as the micro level, and even where possible at the sub-micro level. Thus every possible level of detail in any economic analysis can be addressed using the measurement theoretical tools available. It becomes unignorable!

As regards scalability wrt. Time. Thought experiments involving how a sequence of transactions would be represented at a high level of time resolution may be very suggestive of how the transactions as a whole, or the aggregate transaction, “should” be represented. It would also be relevant to be able to address how to compile a monthly or weekly macro aggregate like GDP. Some economist colleagues work on stock prices where the associated time scale be involved fractions of a second. For these reasons the measurement theoretical tools should also allow a free choice of scale wrt. Time.

3 Measurement theory’s elements

First we need to consider the issue of existence of what we are discussing!

3.1 The concept of the “*true*” value of a NA variable for a given economy over a given period

Definition of observability of a concept: If we are able to create a measurement experiment, drawing on sufficient means, which would yield (increasingly precise) values for a given concept in a given situation, then that concept’s values are observable (in Principle; the more financial resources are needed to obtain

the observations, the less feasible to observe at present).

Definition of the true value of a given NA-concept in a given situation: If we are able to create a sequence of measurement experiments which would yield relatively more certain values for a given concept in a given situation, then that the value to which these results converge is called the true value of the given NA-concept. Again we assume the necessary funds are available for the measurement to take place. We shall speak of this as “under full information”.

It seems like a desirable feature that if a concept is observable, then at the same time it is assured that it is meaningful and well-defined to talk about its true observable value.

3.2 What we need to record: the virtual descriptive economic database (VDED)

In §2.8 of SNA2008 the following question is used to sum up what may guide the analysis of flows and stocks:

“Who does what, with whom, in exchange for what, by what means, for what purpose, with what changes in stocks?”

It continues:

“Answering these questions for all economic flows and stocks and operators in a given economy would provide an enormous amount of information describing the complete network of economic interrelations.”

It is this idea which as I consider a very deep insight which deserves more prominence. This virtual feed of information with the precise recording of economic phenomena, and its storage, I call the virtual descriptive economic database (VDED). How to create the record structure so the VDED becomes a “sufficient statistic”² for the economist, so that no other reference to the eco-

²Term borrowed from mathematical statistics, and in this context given the following definition.

conomic phenomena beyond their representation in the VDED is necessary for economic analyses, that is part of the task we are faced with.

In order to develop a perspective on which elements we may need to know in order to determine the record(-s) to describe the economic actions of agents the components of that question are made even more explicit in the accompanying box³. It is the ambition that we develop this further, so all presentations of NA results may be derived from a database with records which answer the full question. Actually to the extent that the values of all NA-variables may be derived as sums over the records of this database.

The essential question of NA

- | | |
|--|---|
| • units | 1. <i>who</i> |
| • transactions | 2. <i>does what (on which usual/unusual terms)</i> |
| • purpose | 3. <i>with what purpose</i> |
| • assets/products | 4. <i>with which assets/products</i> |
| • region/country | 5. <i>where</i> |
| • price level/concept | 6. <i>at what value concept and prices (and quantities)</i> |
| • units | 7. <i>with whom as counterpart</i> |
| • time | 8. <i>at what time</i> |
| • assets/products | 9. <i>(in exchange) for what; which payment or reciprocal product</i> |
| • assets/products | 10. <i>with what change in stocks (as a result)</i> |
| • combination of assets, products, labour and capital services | 11. <i>by what means; drawing on (consuming) which economic resources</i> |

Adapted from SNA2008, para. 2.8, page 16; slightly extended

A fuller version of the record structure grows in appendix 2.

³Note that the contents of this box has been presented in a lecture given by the author at Matsuyama University, Matsuyama, Japan, Dec.1, 2014.

3.3 Presentations and common aggregates

The institutional sector accounts is one of several central presentations of the NA-results.

3.3.1 Decomposition frameworks

The basic observation motivating this section is that when we are able to break-down the data we have, over say a product dimension, then we have a number of identities which help in checking against different subtotals on which we also have information. Thus it enables us to bring more of the available information to bear on the components of the aggregate figures, and thus may strengthen its validity in different ways. These frameworks are central tools during the balancing process in order to achieve figures which collectively are complete, consistent and coherent.

3.3.2 The commodity-flow framework.

<3D commodity-flow framework illustration>

3.3.3 The 3D financial asset “cube”.

<illustration>

3.3.4 The non-financial asset framework (one for gross capital expenditure matrix and one for assets)

<illustration>

3.3.5 The 3D-cube for Institutional sector accounts.

<illustration>

3.4 From economic phenomenon to user's analysis: where uncertainty creeps in⁴

3.4.1 The four-fold division of uncertainty components

The uncertainties associated with the specific use of a specific statistical figure are easier to realize if the production of the statistical figures is thought of as a process of reconstructing something for which we do not have directly observed data (i.e. the values of precisely defined empirical concepts).

The different components of uncertainty may be divided into those associated with the reconstruction process itself (as “post-data construction process”), those associated with the data construction process, and those associated with the stochastic nature of reality itself. This division also reflects the point of view of the national accounts compiler:

- the *reconstruction part* is typically associated with the national accounts departments,
- the *data-construction part* is typically associated with the departments producing primary statistics, and
- the *stochastic nature of reality itself* is associated with the nature of “what is measured”.

From the point of view of the critical user, a further component is needed, and in some cases it is the most critical of all,

- *the use of the figure*, viz. the association of a specific figure with a specific (theoretical, empirical or practical) concept.

Only the user is involved here. A hierarchy of different uses which may be elaborated is briefly considered here, but not any further. To indicate the idea:

⁴This section draws heavily on Osterwald-Lenum (2000).

one user will most often make the same use of a given figure as others have before her in order not to be liable to a criticism of too personal an interpretation. This way there are more or less "conventional", "authoritative" or "official" uses of a given figure. In turn this implies that some uses are more important to address in evaluating the uncertainty associated with the use of a given figure, than others. Thus some of these uses are particularly relevant to consider in this paper.

Of these four components the *data construction part* for survey data is quite well understood through the elaborately developed statistical sampling theories. Whether the same may be said of register data I do not know at present.

The *reconstruction process component* is less well understood, but a lot of practical experience has been gathered by the national accounts departments of NSIs around the world, and of international organizations like EU, IMF, OECD, and the UN.

To establish how well the last two components are understood in general, some discussion and examples are given.

The *stochastic nature of the relevant part of reality* is an area of much research as evidenced by the many micro economic and micro econometric studies of the last two decades or so. But due to the specificity of this kind of knowledge, much, much more research is needed. <Examples ... >

The uncertainty component due to the association of specific statistical figures with specific theoretical, empirical or practical concepts is probably the least understood of all.

Much very specific information is required to be able to quantify the consequences of using a figure which is defined (slightly) differently from the definition of the theoretical or empirical concept, the measurement of which is intended by the user, or needed for the validity of the inferences made by the user.

3.4.2 The uncertainty associated with a figure depends on its uses.

5

In order to be able to speak of the uncertainty of a given figure we need to have a clear understanding of the nature of that figure with respect to reality and to the conceptual universe we use in discussing economic theories and empirical “matters of fact”.

A simple example should suffice:

If we are interested in the government debt of a particular country which figure is then the appropriate one? In the EU a very specifically defined concept has been defined for the monitor of the requirement of a ratio of government debt to gdp of at most 60 %. The debt securities are at nominal value even if their market value is quite different. The holdings of social security funds of those debt securities are deducted before calculation of the (net) outstanding government debt, even if government is not able to actively control those holdings. Pension obligations to pensioners in a pay-as-you-go system are not calculated, which implies that if government takes over the pension obligations of pension funds (fully funded, with reserves) then government debt goes down. Even if no pensioner has experienced a reduction in the current or future pension! Figures for the ratio of the government debt to gdp collected for the comparison of the situation in different countries may actually be incomparable if they are taken at face value, due to differences in which exact components have been included and which not. Most of the financial instrument definitions of the NA manuals are open to interpretation in certain complex situations. Thus the specific interpretation of the National Statistical Institute (NSI) is not exact.

This example points to the fact that there are important issues of exact definition of the NA concepts (especially of individual categories of the classi-

⁵The focus here on the importance of different uses is inspired by Ohlsson (1953).

fications) definition of the exact coverage of the statistical concept consistent valuation of the components of the statistical concept distortions of statistical definitions due to the administrative use of those statistical concepts

In conclusion the uncertainty associated with a given figure is dependent on the use of the figure. Thus we need to consider the use of the given figure when we provide and decompose the measure of uncertainty. This may well be one reason why the values of simple uncertainty measures are not given along with the presentation of the figures themselves.

3.5 Extension from historical periods to future periods?

Perhaps we need to be able to establish a comprehensive set of methods to produce NA for the current and future periods, corresponding to the current expectations of the agents of the economy? This could help highlight serious imbalances among plans and expectations.

4 Measurement manual for users

Most users should not need to worry about *how* the NA-figures are reconstructed. If only compilers could indicate, with uncertainties, how far those figures are from the “true” NA-figures, i.e. which would have been derived by sums over the VDED, this would be enough for most.

Increasing teach-ability of the SNA-manual would for this reason be enhanced if the many comments and reminders *for compilers* are moved to separate chapters.

Focus in a measurement course would be on the analysis of actual agents into SNA-units, of actual behavior into transactions and other flows, of holdings of assets into SNA-assets, of prices and volumes into SNA-prices and -volumes, and the record structure of the VDED as a representation of what we can

know (in principle) of observable facts about the economy. Also a knowledge of the publicly available representations of the VDED which are available for the particular country of interest.

How to construct the contents of the central database would be an important subject for non-NSI compilers of NA statistics.

4.1 Measuring a theory

How do we derive the most relevant way to measure the concepts, relations and empirical statements of a theory? For all uses of NA-statistics it is important how to measure, and identify the right observations for the task at hand.

By defining the virtual database of economic descriptions for an economy we make clear which economic observations are potentially available. Authors of theoretical contributions may then be asked to indicate how their theoretical concepts and model constructs relate to this potential information database. If it is not possible to make this connection we are led to the conclusion that the theory in its current form does not (yet) have an empirically relevant counterpart (form). This could perhaps create a strong incentive for economists to work to bridge the gap between the realm of theories and the realm of observable phenomena, and to make exploration of such connections easier and more straight forward.

5 Conclusion

In this paper the author has pointed by means of sketches to five areas in which further work could focus on developing:

1. The short condensed version of the NA, the principles, which form the core, on which an in general sufficient understanding can build; especially in-

tended for research users. To achieve improved teach-ability of the essence of the NA.

2. Extensions of the essential question of NA in order for the associated Virtual Descriptive Economic Database to be sufficiently rich for all economists to be able to articulate exactly which observations (from the VDED) which are important for their work.
3. Two presentations of sets of principles on methods useful for reconstructing the NA-representation of a given economic phenomenon; a thin one for research users, and a more elaborate one especially intended for compilers, both inside NSIs and outside.
4. Quantifications of and methods to develop quantifications of the uncertainty associated with a given specific instance of a variable for a given use. To achieve measures of reliability of NA figures. Adding the quantifications of the uncertainty associated with each NA figure helps to relieve users of having to know how the compilers actually did. As new specific ways of reconstructing NA figures evolve over time, this could relieve users in a substantial way.
5. Establish a meta-language in which to describe the economic measurement process precisely, and become a source of continually pointing to research projects which will advance the available concepts, methods and their usefulness. To promote NA theoretical work and enable it to enrich the discussion of how best to measure a given economic phenomenon, and to focus minds on the great amount of work still needed for a fully articulated measurement theory of Economics to emerge.

6 Further research

How to establish and characterize a mapping between the theoretical concepts of economic theories and the VDED is a topic of further research. Establishing an effective language in which to discuss measurement issues is also on the research agenda, as well as a lecture series on the national accounts for graduate students. Develop a presentation on effective methods how to reconstruct the contents of the central database for non-NSI compilers of NA statistics.

7 Acknowledgements

Thanks are due to a number of present and former colleagues at Statistics Denmark for continual encouragement to reach for high quality in National Accounts work and understanding why we do what we do: Søren Henri Larsen, Therkild Therkildsen and Jens Holst Jensen. Lastly to Bent Thage for early on in my NA career to have pointed to the literature of our Scandinavian precursors.

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Appendix 1 The NA core concepts and principles (in a few pages)

The kinds of units.

The kinds of actions. Production. Bilateral Exchange (Purchase/Sale; barter;). Unilateral exchange (transfer).

The kinds of assets, owned by different units.

The kinds of products.

The kinds of prices.

Appendix 2 The record structure of the virtual database holding observable economic descriptions

	<i>field</i>	<i>kind</i>
1	who	units
2	does what (on which usual/unusual terms)	transactions, (and conditions of transaction)
3	with what purpose	purpose
4	with which assets/products	assets/products
5	where	region/country
6	valued at which (monetary) amount	units of (which) currency
7	at what value concept and prices (and quantities)	price concept, price level and price index
8	with whom as counterpart	units
9	at what time	time
10	(in exchange) for what; which payment or reciprocal product	assets/products
11	valued at which (monetary) amount	units of (which) currency
12	with what change in stocks (as a result)	assets/products
13	by what means; drawing on (consuming) which economic resources	combination of assets, products, labour and capital services
14	based on what expectations	aspects of future states of the economy