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Turning statistics into information: indicator sets and visualizations

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TURNING STATISTICS INTO INFORMATION: INDICATOR SETS AND VISUALISATIONS

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Summary: It's probably safe to say that the world statistical agencies possess a wealth of data which are underused. Either the existence of certain indicators is entirely unknown to users, or they are unaware of their relevance for certain phenomena. Sometimes they are just too to difficult find. This leaves statistical agencies vulnerable to the charge that they do not supply (relevant) information on important developments. But this also constitutes an opportunity; there is much to gain by just making existing statistics easier accessible and easier to interpret. Statistical storytelling is a way to achieve this. If done right, it consists of two parts; constructing indicator sets and designing visualisations. Coherent indicator sets are collections of statistics relevant for a certain topic. By collecting the most relevant indicators, the value of each individual indicator is increased and a (more) complete and new picture of developments becomes available. It is also a way to showcase the range of statistics available. Coherent indicator sets come in many forms, ranging from very basic to highly sophisticated. This paper proposes a classification in four types of increasing complexity. Visualisation design is a separate phase, which takes place mostly after the construction of the indicator set. A well-thought out presentation can greatly enhance the effectiveness of statistics. Generally, for most users almost any form of graphical representation is easier to interpret than a table. Some examples are given here.

[1] The authors would like to thank René de Vos and Lennart Rhee for providing the financial accounts overview.

1. Introduction and relevant concepts

It is probably safe to say that most of the world's official statistical data are underused. Either they are not publicly available, locked away in complicated websites and databases, or their existence and relevance are unknown to potential users. Whatever the cause, there is a wealth of statistical data available which is unexplored. I explicitly use the expression "statistical data" and not "statistical information", as one of the propositions of this paper is that data or statistics are not automatically information. Users typically turn to National Statistical Agencies (NSI's) looking for information on a certain subject, being economic growth, industry sector data, environmental developments. NSI's tend not to give information on subjects, but data; we give the SNA, NACE, SITC, PRODCOM. This type of organisation more reflects the statistical production process than the real world phenomena that are meant to described. This paper concerns itself with certain methods of turning statistical data into information; the construction of indicator sets and the use of data visualisation techniques. Together these form the art of statistical story telling. There are of course other ways of turning statistics into information; producing reports and/or specific analysis pieces. But these are expensive and difficult to produce, and still need to be publicized to make the information available to users. Also, the more data-based an analysis is, the more objective and indisputable the outcome will be.

The principal aim of statistical story telling is to reveal more of the information contained in statistical data, and to make it easier available and easier to interpret. The added advantages of using indicator sets and visualisation techniques are that this can be done objectively and in a reproducible manner. This last property is also of practical importance. In most cases using data sets and visualisations has the character of a pure investment; it might take more or less substantial resources upfront to construct and build. Once up and running though, actual running cost and capacity needed for production tends to be negligible. This is due to the fact that by using database techniques and web tools, production can be virtually automated. And these statistical tools, which is what they are, tend to be based on existing statistics, meaning that there are no data collection and processing costs.

The bulk of the added value of statistical storytelling lies in presenting statistical indicators in a coherent and structured fashion. The visualisations tend to grab most of the attention, but they are mostly means for communicating more effectively the information contained in the data set. Presenting your data in the most effective manner is actually a largely separate issue from choosing which data to present. That is the fundamental issue, and this is where most information can be gained. By selecting the most relevant indicators for a certain phenomenon, and presenting these together, a more complete view is presented and a more thorough analysis of

developments made possible. This highlights two crucial aspects of this approach; knowing beforehand what information exactly is to be communicated and constructing the indicator set. If it is not clear what the aim is of the indicator set or visualisation is, what type of analysis it is supposed to facilitate, an unfocussed and possibly worse than useless product will result. A similar argument holds for the selection and treatment of the statistical indicators in the set. A well-structured selection process with clear methodological requirements will result in a more coherent and useful indicator set.

This might sound daunting, but an important part of the message of this paper is that indicator sets and visualisations come at different levels of complexity. Statistical storytelling can have different goals, and the level of ambition determines the complexity of the required indicator set and the skills and knowledge needed in the development process. This paper identifies four levels of complexity of statistical storytelling, depending on the desired function of the statistical tool. The most basic form is collecting the available indicators for a certain subject, whilst in the most advanced application the indicator set is used to perform some type of sophisticated economic analysis. In between these two extremes lie two intermediate forms. A step up from simply collecting indicators is using an indicator set for giving as comprehensive a description as necessary of a certain (economic) phenomenon. This requires identifying and selecting (the most) relevant indicators. No attempt is made however at somehow aggregating the information contained in the indicators. A further increase in complexity and sophistication results therefore in an indicator set and application which does attempt to summarize the relevant information. The aim is to give an overall view of the current situation. It should be clear that increasing the desired complexity results in an increase in the resources required for developing the indicator set and accompanying applications.

But even the basic form of statistical storytelling, collecting the available indicators and presenting them in one place can already be a great improvement in accessibility and usefulness of statistical data. For example, indicators available for a sector of industry might include turnover data, price data, employment data, sentiment data and population data. These are typically collected by different agencies or branches of an agency, and thus published and available separately. Presenting them together will have two main effects. Firstly; it will result in a more complete and more clear picture of the current situation. It will also show what data are available relevant for this sector. The concept of increasing complexity also holds for data visualisation. The simplest form of visualisation is a bar or line graph, but even these are already much easier to interpret than a table, especially when more indicators are involved. The trick is to search for the form which most effectively communicates the information in the indicator set. Thus, the required complexity of the visualisation depends on the function of the indicator set.

A large part of the knowledge required for statistical storytelling tends to be already present in statistical institutions, but mostly latent. Good other sources of ideas and information can be national and supranational institutions, the press, relevant websites and the academic literature. It is good to stress here again that statistical

storytelling can greatly enhance the value of statistics, or more correctly put can help unlock the potential and value present in the data. Simply showing indicators together and structured around a specific topic will result in an increase in information content and a much better fit with user needs. But it will also highlight relations and connections in the economy and data, making individual realisations easier to interpret and resulting in a more reliable analysis of the current situation.

2. Types of indicator sets

In the previous section, four levels of complexity in indicator sets and statistical storytelling were identified. The types of indicator set, ordered according to increasing levels of sophistication are: indicator sets which simply collect the available indicators, indicator sets which aim to give a comprehensive and relevant description of a certain topic, indicator sets which try to summarize the relevant information on a certain phenomenon, and finally indicator sets which are constructed to perform a sophisticated economic analysis. The complexity increases with increasing levels of ambition in the design function of the indicator set. This section will consider each type of indicator set in some more detail, using examples mainly derived from Statistics Netherlands range of web publications.

2.1 Data collection indicator sets

This most basic form of statistical storytelling is relatively widespread. Many institutions and press publications already practice it. Characteristic for this approach is the collection of all indicators available which are deemed interesting for reporting on the developments in a certain area. A main subject for this approach is general economic conditions. An example is the core table of monthly indicators from Statistic's Netherlands Economic Monitor (figure 1), but also the Principal European Economic Indicators of Eurostat. The advantage of this approach is that the user gets a good idea of which indicators are available and can be relevant. But this table also highlights two disadvantages of this type of indicator set: indicators are typically grouped by type of statistic, thus obscuring which indicators might be relevant for the interpretation of other indicators. Furthermore, the number of indicators included can quickly become very large as there is no structuring framework or selection criterion. Presentation wise, this table shows that presenting data numerically can result in very hard to interpret tables, especially for the untrained user.

Figure 1; Statistics Netherlands Economic Monitor core table of short-term economic indicators.

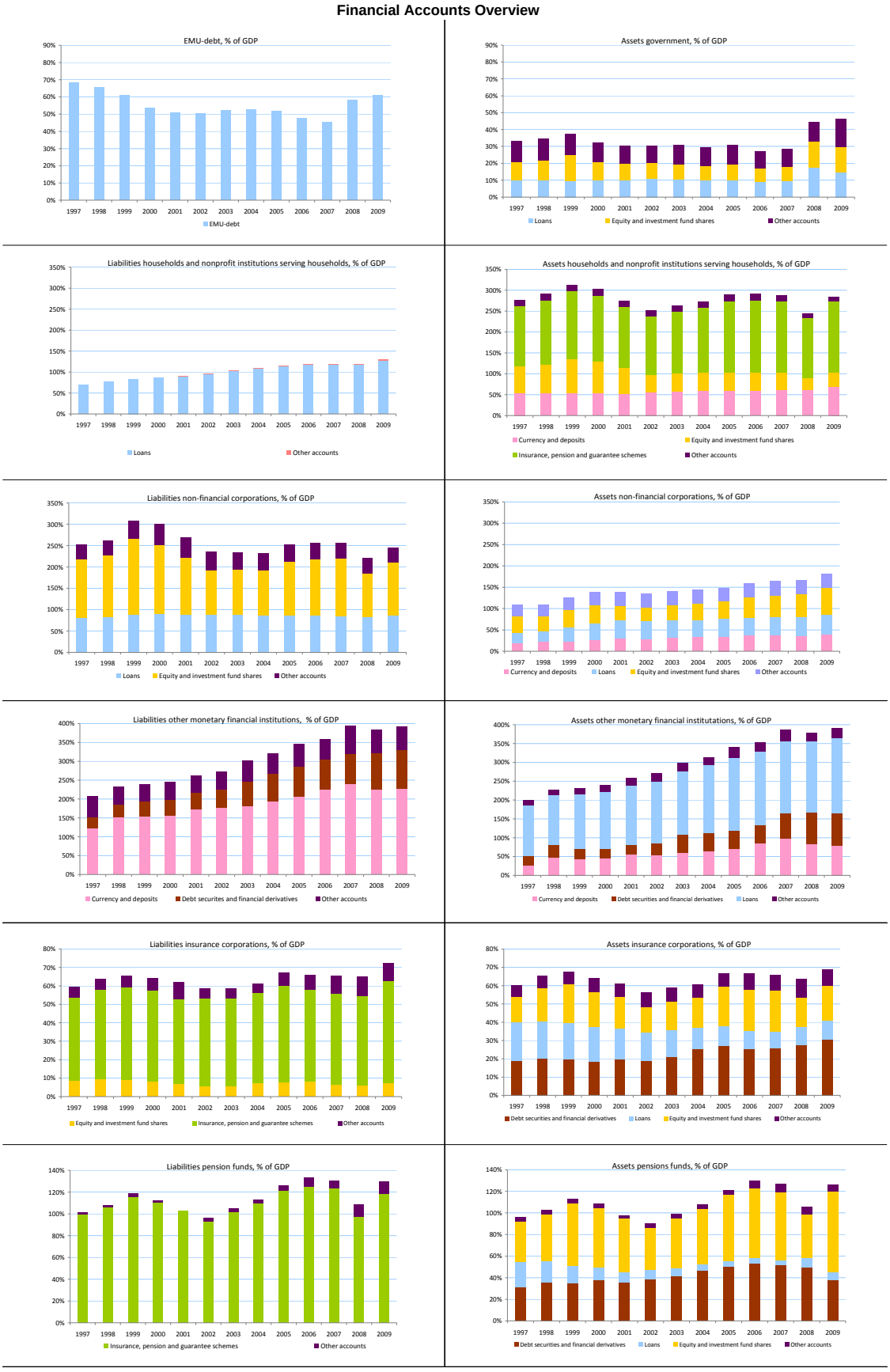
Economic indicators, monthly

Percentage changes on corresponding period of previous year, unless otherwise indicated

	Average '07/'08	2009			2010				
		Year	3rd qr	4th qr.	1st qr.	2nd qr.	Jul	Aug	Sep
Quarterly indicators (volume)									
Gross domestic product	2.9	-3.9	-3.7	-2.2	0.6	2.2			
Imports of goods and services	4.5	-8.5	-8.8	-4.1	7.0	14.1			
Consumption	2.0	-0.2	0.1	-0.3	0.3	0.8			
households national	1.4	-2.5	-2.4	-2.5	-0.7	0.1			
general government	3.0	3.7	4.6	3.5	2.1	1.7			
Gross fixed capital formation	5.3	-12.7	-14.5	-15.1	-11.7	-4.2			
business	5.3	-16.4	-18.8	-18.2	-12.9	-4.6			
general government	5.5	5.8	6.1	-1.2	-7.0	-2.8			
Exports of goods and services	4.6	-7.9	-7.5	-1.2	9.5	12.2			
Monthly indicators (volume) [7]									
Production manufacturing [3]	1.3	-8.9	-7.8	-2.3	5.3	8.9	6.7	7.0	-
Stocks of finished products manufacturing	4.9	-6.3	-10.3	-11.8	-14.7	-13.7	-7.4	-	-
Consumption of households, domestic	1.4	-2.6	-2.7	-2.4	-0.2	0.9	0.2	1.6	-
Import of goods	4.6	-11.6	-11.9	-7.0	8.7	18.3	14.0	13.5	-
Export of goods	4.6	-8.8	-7.3	-1.6	11.6	13.8	12.5	14.8	-
Private fixed capital formation in tangible assets	-	-	-	-	-	-	-3.4	-	-
Monthly indicators (value)									
Turnover manufacturing	7.0	-20	-22	-7	12	18	12	15	-
Turnover retail trade	4	-5	-5	-4	-1	0	1	1	-
Sentiment indicators [1]									
Producer confidence manufacturing industry	4	-14	-11	-7	-5	-1	-2	0	0
Consumer confidence [2]	-6	-22	-19	-15	-12	-16	-14	-11	-14
Expected turnover in business services	34	-9	-2	6	19	9	-4	9	38
Prices and wages									
Consumer price index (CPI)	2.1	1.2	0.3	0.9	0.9	1.0	1.6	1.5	1.6
Producer prices manufacturing output [9]	5.6	-10.2	-13.3	-4.1	6.4	10.2	8.9	7.7	-
Import prices of goods	3.2	-7.6	-10.4	-2.3	4.7	8.5	7.9	6.8	-
Export prices of goods	3.1	-8.4	-11.1	-6.1	2.6	8.5	7.3	7.2	-
Terms of trade	-0.1	-0.9	-0.8	-3.9	-2.0	0.0	-0.6	0.4	-
Price owner-occupied dwellings	3.6	-3.3	-5.1	-5.0	-4.4	-1.9	-0.9	-0.4	-
Crude oil, North Sea Brent ($ a barrel)	85.5	62.4	68.9	75.4	77.9	79.4	75.3	77.5	75.0
Euro ($)	1.42	1.39	1.43	1.48	1.39	1.27	1.28	1.29	1.31
Contract wages [8]	2.7	2.7	2.3	2.2	1.4	1.1	1.1	1.2	1.1
private sector	2.7	2.7	2.3	2.3	1.1	1.0	1.0	1.0	0.9
general government	3.2	2.7	1.9	2.1	2.1	1.6	1.8	1.9	1.9
Labour market									
Jobs of employees (x 1,000) [2]	7903	7887	7854	7840	7808	7832			

An improvement is possible by constraining the subject somewhat more and by using graphs, as is done in the experimental Statistics Netherlands Financial Accounts Overview.

Figure 2; Financial Accounts Overview.



This indicator set shows the financial positions of main sectors of the Dutch economy. Assets on the one side, liabilities on the other, broken down by asset type. While these are relatively sophisticated statistics, they are just that, statistics. The presentation and the required computations are rather straightforward. The level of ambition is relatively low, just giving an overview, without any pretensions of conclusions to be drawn or completeness. It is basically a set of graphs, but this is still a very useful dataset. Its strength lies in rigid adherence to its simple, but illuminating concept and economy-wide coverage. Furthermore, and maybe even most importantly, this easily read overview of this, quite relevant, aspect of the economy is not available anywhere else, which is the base of its usefulness. When comparing this indicator set with the Economic Monitor table, it is clear that using graphs makes it much easier to read and interpret what is happening. Using graphs also makes it easy to show developments over time, again enhancing the utility of the statistics. This example shows that the data collection approach is based on publishing a collection of indicators with a certain theme, and that its strength lies in showing together what is only available separately elsewhere.

2.2 Descriptive indicator sets

This is one step up the complexity ladder. The aim is now to give a more comprehensive and structured view of developments concerning a certain phenomenon, for example a sector of industry. This means that the methodological bar is raised somewhat: there needs to be an idea what important facets of the subject are, and what type of information is required to represent these. On the other hand, this automatically results in selection and structuring criteria. The main differences with the collection-type indicator sets are in the more structured selection process and a striving for maximum relevance. The idea is to bring together a selection of the most relevant indicators connected to the phenomenon to be described, covering all or most important aspects. Therefore, statistics are no longer presented grouped according to type of statistic, but different types of statistics are brought together, showing their connection to the central phenomenon. Of course, the exact nature of the facets to be covered and relevance will depend on the type of phenomenon to be described.

Figure 3; Retail Trade Scan

An example is the experimental Statistics Netherlands sector scan for the retail trade. It brings together all relevant statistics published by Statistics Netherlands related to the retail trade. A keyword here is relevant; it is a selection of the available statistics, selected to give an as complete as possible and necessary overview of what is

happening in the retail trade. The scan contains turnover data, sentiment indicators, price data and staffing indicators. Usually, these different types of indicators are to be found at different places on the Statistics Netherlands website and in the Statline database. Showing them together gives a striking new view on the dynamics in the retail trade. It also shows users the whole range of statistical indicators Statistics Netherlands has available and may be of interest. The idea is to construct scans like this for as many sectors of the economy as possible, allowing a new layer of analysis below the macro-level. Note that the presentation need not be fancy, simple graphs will do here. The added value is in the comprehensiveness, structure and non-numerical presentation.

2.3 Summarizing indicator sets

At this level of complexity and ambition, the focus shifts from description to analysis. This means that the resulting products will have a higher information content, but also it also entails more exacting methodological standards. Instead of just showcasing relevant statistics, the aim is now more for a specific result, to facilitate a certain type of analysis. In the case of summarizing indicator sets, the aim is to give a picture of the (overall) state of affairs in a certain field or aspect of the economy. It summarizes the situation and shows how things are developing overall. The structure of the indicator set, i.e. the indicators it contains and how they are presented, now becomes part of the analysis. It should allow the user to reach a conclusion of how the central theme is developing. The structure of the indicator set then gives information on what factors are relevant for describing and analysing this theme.

Designing an indicator set which is able to produce an accurate overall picture of the situation means that one needs to have a benchmark against which to evaluate the indicator set and which can guide the development process. As far as I know, this can take two forms. The most simple case is when there is a single reference indicator which gives a good representation of the development of the central theme. This can be for example consumption or turnover growth. A more complex alternative is when there is no clear single reference indicator, but there is a predefined theoretical or statistical framework which describes the phenomenon to be analysed. The framework can then indicate what type of developments are relevant, and one can try to find indicators representing these factors. Clearly, this type of indicator set requires more skill and knowledge to construct, and that the standards against which they should be evaluated are higher than before. The other side of the coin is that the final product will be much more information-rich, and therefore of value to the user. It will exploit more fully the information latently present in the source statistics.

An example of this type of indicator set is the Statistics Netherlands Radar concept[2]. These are meant to describe how conditions for exports, consumption and business investment are evolving. Conditions were defined as the resultant of the developments in several underlying fundamental factors. These were identified at the start of the development process, which after that mainly consisted of collecting and selecting the most relevant indicators representing these underlying factors. The outcome was three sets of six indicators, see below.

[2] Van Ruth, F. “Monitoring conditions for consumption, exports and fixed capital formation; the radar concept”. Statistics Netherlands discussionpaper 201019 (2010)

Figure 4; Indicator sets selected for Statistics Netherlands Exports Consumption and Business Investment radars.

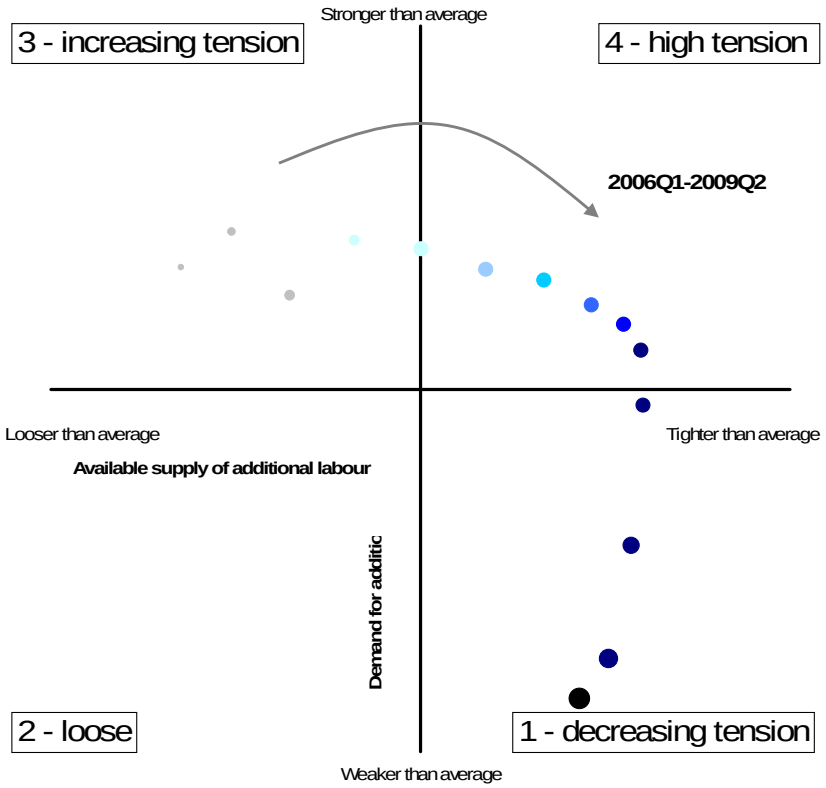
Exports	***Consumption***	***Business investment***
Assessment foreign order book – manufacturing survey	Financial situation next 12 months – consumer survey	Assessment order book – manufacturing survey
Real effective exchange rate	Expected development unemployment – consumer survey	Consumer confidence
Producers' confidence – Eurozone	House prices	Stock market
Export order book – Eurozone	Stock market	Capacity utilization manufacturing
Producers' confidence – Germany	Staffing expectations – manufacturing survey	Exports
Industrial production – Germany	Jobs	Long term loans

The selected indicators have a strong intrinsic link to the respective reference indicators, and represent the most relevant influences on the target phenomenon. The result of this procedure is in effect a selection of the most relevant statistics for analysing the development of exports, consumption and business investment. Thus, cross-relations between different statistics are shown, and the dataset also implicitly communicates knowledge about economic structures. This means that realisations will appear less random, and future developments should come as less of a surprise. The methodological framework and the explicit benchmarking mean that the resulting indicator set is coherent and relevant. Of course, a summarizing indicator set requires a different type of presentation from descriptive indicator sets to be fully effective (see figure 9). The next section will elaborate on this.

2.4 Analytical indicator sets

The most complex type of indicator set published by Statistics Netherlands are analytical, i.e. their function is to produce a definite statement over some pre-defined aspect of the economy. This is a halfway point between statistics and economic analysis. It is therefore more part of reporting on current economic conditions than of publishing statistics. Examples are the Business Cycle Tracer, which was designed to determine the state of the business cycle, and the experimental Labour Market Tension Gauge, which can be used to characterize the state of the labour market. Both use a highly structured template to extract meaning from a carefully selected group of statistical indicators. Here, the selection process was based not purely on statistical criteria, but also on economic considerations. The fact that these analytical tools yield relatively definite statements on economic conditions means that during the development process, stringent benchmarking of the outcomes is a must. Thus, this approach requires high levels of skill and knowledge, but the resulting tools yield outcomes of high added value to users. The Labour Market Tension Gauge is a tool which allows a structured analysis of the situation on the labour market[3]. It is therefore also a method of presenting labour market statistics in a structured fashion, enhancing their meaning.

Figure 5; Labour Market Tension Gauge

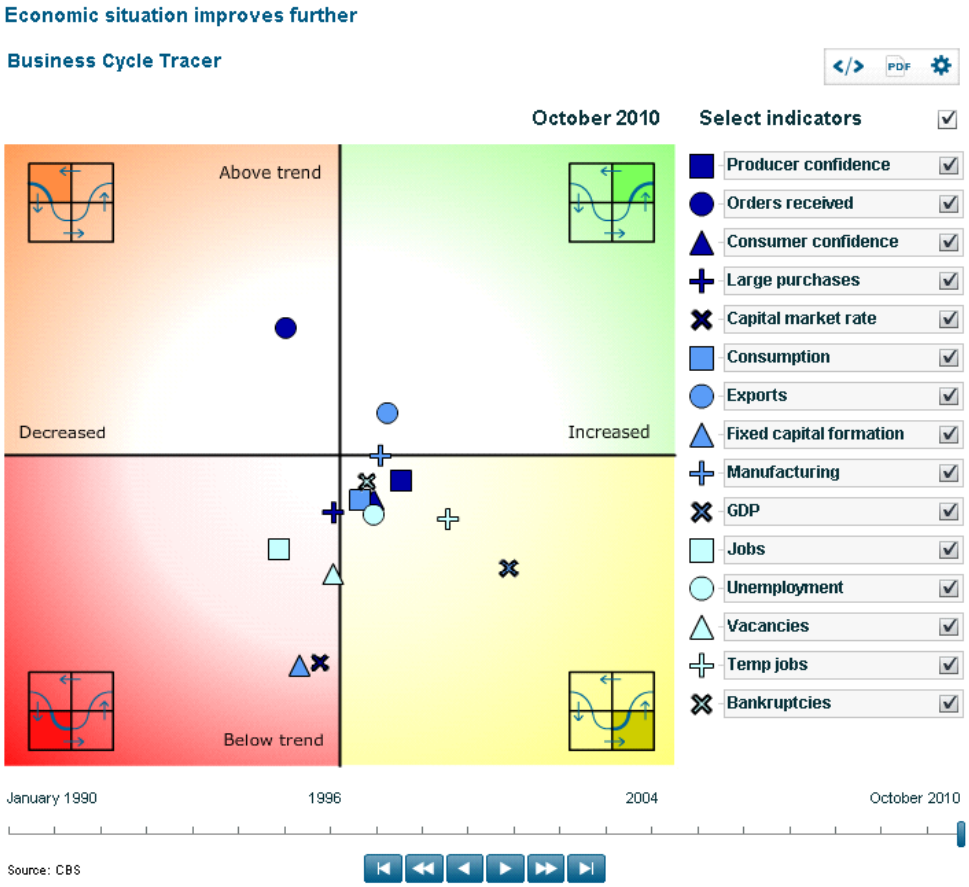


[3] Van Ruth, Floris "Analysing the labour market; a tension gauge" Statistics Netherlands discussionpaper, to be published.

The fundamental idea is that the labour market is a market, and therefore a complete analysis requires indicators of both labour supply and demand. A confrontation between the development of these two types of indicator then results in a characterization of the labour market in one of four possible states. Thus, latent information present in these labour market statistics becomes visible, resulting in a more precise and meaningful reporting on labour market conditions. Note that there is no element of judgment required in this analysis. Outcomes of the Gauge were benchmarked against contract wage developments and survey data on relevant economic conditions. Here, the message is both in the indicators used and in the form of presentation.

For completion's sake a short description of the Statistics Netherlands Business Cycle Tracer[4] will be given. It is interesting to compare the Business Cycle Tracer with the Labour Market Tension Gauge, as the look of the two analysis tools is very similar, but the actual structure and functioning is very different.

Figure 6; The Business Cycle Tracer.



[4] Van Ruth, F., Schouten, B. and Wekker R. "The Statistics Netherlands' Business Cycle Tracer. Methodological aspects; concept, cycle computation and indicator selection" (2005) available online at www.cbs.nl

The structure of the diagram is crucial; in the Labour Market Tension Gauge, the axes represent *different* variables, whilst in the Business Cycle Tracer the axes represent respectively the short term development and distance to trend of the *same* variable. The set up of the Business Cycle tracer results in four different combinations of short-term development and distance to trend, which each define a different phase of the business cycle. The diagram is in effect a visual representation of these different phases. It is therefore not only a tool for analysing business cycle developments, but also a way of communicating the business cycle concept. The graphical presentation means that the development of each individual indicator is immediately and robustly characterized by the quadrant it occupies. No additional analysis is required. The dynamic nature of the tool, i.e. the time function, means that the dynamic nature of the business cycle is shown as well.

3. Presentation and visualisations

After the amount of attention paid to indicator set construction in the previous section, it might seem that presentation is merely an afterthought. The opposite is actually true; the effectiveness with which the information contained in an indicator set is communicated, hinges largely on presentation. Visualisations, if done right, can greatly enhance the impact and comprehensibility of statistical data. In many cases preparing and designing the visualisation takes place after the construction of the indicator set. Designing a visualisation is not merely a question of presenting an indicator set: the visualisation should serve the intention and goal of the indicator set. An effective visualisation presents the message contained in the indicator set clearly and almost in a single glance. It means that the graph should be clear, unambiguous and that the important story in the data must be known by the designer of the visualisation.

In the case of designing a comprehensive set of indicators it is wise to start the design of the visualisation in an early stage. A prototype visualisation generates feedback on the indicator set. The prototype might suggest that an indicator is missing, that an indicator is superfluous, or that indicators should be transformed or normalised to some scale. It might also reveal that a mapping of an indicator to the desired visual attribute of a graph is not effective. Beginning early avoids later on costly adjustments.

Visualisations range from a simple static graph to highly interactive animated graphics. The more interaction and animation, the costlier the design of the visualisation. More interaction and animation, i.e. more complexity, isn't necessarily better. If a simple static graph can get the important message across, there is no need in adding interaction or animation. However in all cases the visualisation should serve the original goal of the indicator set.

Guidelines for designing effective presentations can be found in UNECE[5] and in several books on information visualisation (Few[6]/Tufte[7]/Cleveland[8])

3.1 Static graphs

Static graphs are excellent in telling the story of a single indicator. They can also be used to show a possible relation in two or more indicators.

[5] UNECE (2009), Making Data Meaningful, Part 2, A guide to presenting statistics

[6] S. Few, *Show Me the Numbers*: Designing Tables and Graphs to Enlighten, Analytics Press, 2004.

[7] E. Tufte, *The Visual Display of Quantative Information*, (2nd editition), Graphics Press, May 2001.

Because the graphs are static and so cannot be adjusted by users, the story to be told must be clear in front. Should the visualisation show the development of an indicator? Or alternatively a break down into components (e.g. regional)? Should the components of the indicator be compared? Or should the development of two indicators be compared? The choice of focus of the story results in a different type of graph. For example development is best shown as a line chart and breakdown best shown using a bar chart. The following paragraphs describe visualisation designs with increasing complexity and costs.

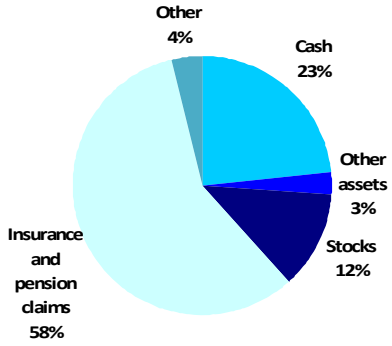
3.1.1 One indicator per graph

The simplest and easiest visualisation is to have only one indicator in a graph and display the graphs side by side.

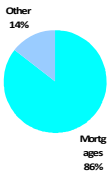
For example in figure 6, the breakdown of the two indicators assets and liabilities of households is given. The size of the pie diagrams makes it also possible to compare the two indicators. Note that this is only possible when the indicators have the same unit. The apparent story to be told is that Household assets are a lot bigger than the liabilities and that the assets are largely composed of pension and insurance claims.

Figure 7:

Households – Assets



Households – Liabilities



These types of graphs are neither difficult nor costly to develop. The typical graphs are line, bar and pie plots.

3.1.2 Large set of indicators

If your set of indicators is very large, it is desirable to aggregate the indicators in a small number of indicators. However, if this is not possible or if it is obligatory to show all indicators, a solution might be to calculate a qualitative value for each indicator: positive, neutral, negative. The score of all indicators can than be shown

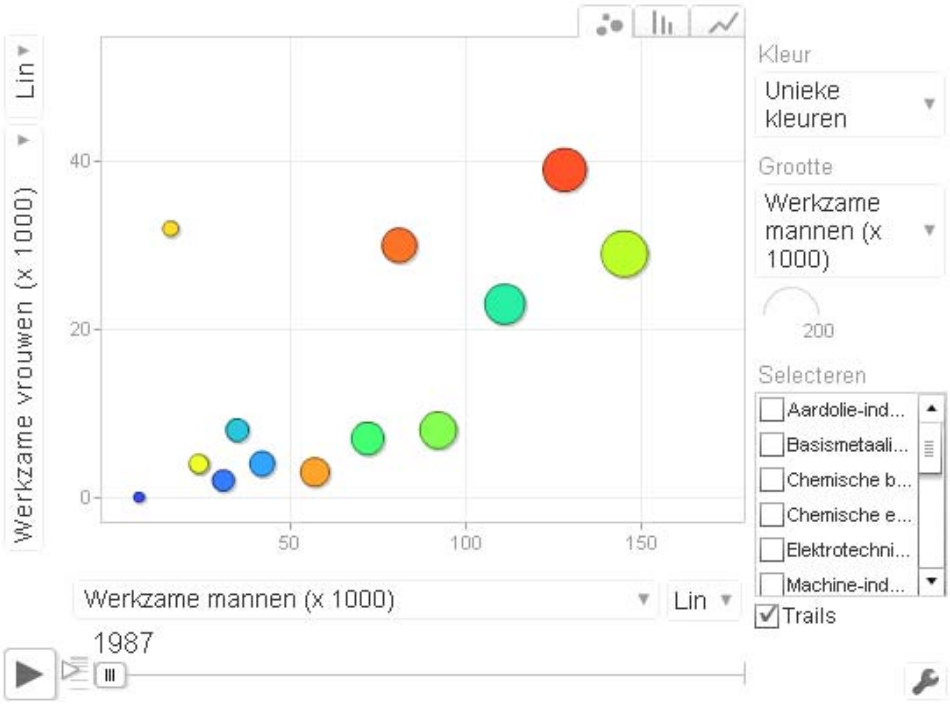
[8] W.S. Cleveland, *Visualizing Data*, Hobart Press, 1 edition, March 1, 1993

in a glance. This is a simple and effective visualisation solution but puts the burden on defining good qualitative measures for all indicators.

3.1.3 Relations between indicators

Slightly more difficult is to show the relation between two or more indicators. The visualisation now acquires an analytical component. This can be down by plotting a scatterplot or bubbleplot for two, three or four numerical indicators. A scatterplot should only be used if there seems to be some form of relation between two indicators.

Figure 8; Bubble plot



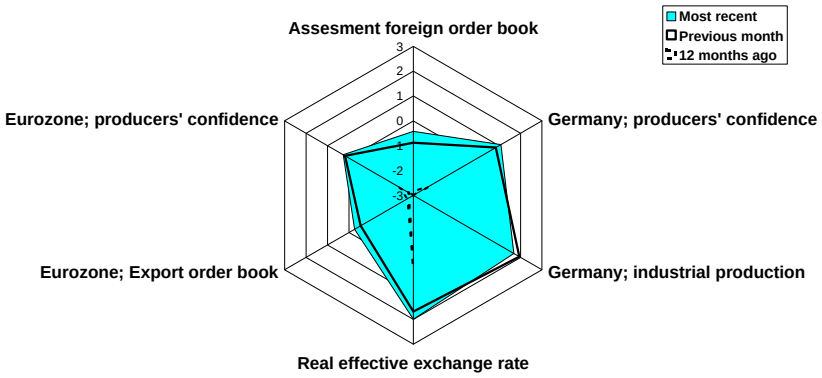
3.1.4 Indicator set view

In the indicator set view the visualisation challenge is to design a view where all indicators are shown together. This type of visualisation is becomes relevant when constructing a summarising indicator set. The analytical content increases, and design and building again become more complex.

The radar concept can serve as an example. Its aim is to summarize the development in conditions relevant for a specific economic indicator. This means that the visualisation should contain an element that aggregates the information of the different component indicators into a measure of overall conditions. In the radar concept, this is the area spanned by the six indicators. The larger the surface area,

the more favourable conditions are, see figure 9. Also, a time dimension is added to allow developments to become visible.

Figure 9; Visualisation of the Radar concept for Dutch exports.



3.1.5 Multiview

In a multiview different views on the indicator (set) are shown side by side. A multiview shows multiple stories at the same time. For example it may show the geographical distribution, the time series of the indicator and a breakdown.

A multiview raises the threshold for understanding the combined story. Users must understand the relationship between the views, otherwise the story is fragmented.

3.2 Dynamic graphs

When internet started, most statistical charts found on the web were bitmaps. These resembled charts in paper publications, in that users could not interact with them. Over years websites made their charts more “dynamic”, by adding mouseover effects. Current technology makes it possible to let users interact with each graphical object in a chart. A dynamic chart embraces two different concepts: *interactivity* and *animation*. Interaction means that users have some control over the visualisation: for example a user can click to select which (combination of) data to show, or select the scale/units.

Adding interaction to a visualisation may result in applications that are more analytical by their nature than communicative. Instead of just “reading a story” through the visualisation, users are invited to detect patterns themselves by interacting with the visualisation. An analytic visualisation typically contains a large number of user controls and works well for statistically literate users.

3.2.1 Selecting

Selecting means that users can select indicators, time intervals and categories to be shown in the visualisation. Selecting can be applied to all above mentioned designs.

If well done, it empowers the user to analyze the indicator set. However, even statistically literate users may not find the important stories buried in the data. An interactive visualisation should therefore try to start with the most important story.

3.2.2 Animation

Animation is increasingly used to make statistics livelier, because current graphical technologies make it easy to create animations. Animation can add value to a visualisation, but it can also be distracting. It should be used with care and knowledge. A very natural candidate for animation is time series data.

For time series animation it is wise to add a media player control where the user can start, stop and rewind the animation. A media player control is very well known and therefore very intuitive. The media player control can be improved by providing a time slider so that the user can slide to a specific period and compare different periods.

Being a natural candidate for animation does not mean that every time series should or can be animated. If the data does not change significantly over time, i.e. if the animation does not reveal data evolution, animation is useless. This principle is comparable to the static case where all data values are equal: making a line or bar chart does not add value.