TIME DISTANCE AS A NEW ADDITIONAL WAY TO MEASURE AND ASSESS THE OVERALL POSITION AMONG AND WITHIN COUNTRIES

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THE TIME DISTANCE PERSPECTIVE IN BENCHMARKING AND ITS ROLE IN DECISION-MAKING

The intention of the OECD World Forum on Key Indicators is to share the information and compare the strategies for measuring and assessing the overall “position” and “progress” of a certain political entity (country, region, etc.) vis-à-vis other similar entities.

The novel time distance methodology proposes a new perspective to the problem, an additional statistical measure, and a presentation tool for policy analysis and debate that is readily understood by policy makers, managers, media and general public.

This makes the time distance measure a very useful complementary tool for analysis and presentation of key indicators. This is not a methodology oriented towards a specific substantive problem but an additional view to many problems and applications. Also, it is not only a question of new broader theoretical concept of disparities and a novel statistical measure with extracting the additional information content from existing data. It profoundly affects also the analytical and decision-making level by providing new insights for evaluation of policy and business situations.

The understanding of the complexities of real life situation is not increased only by an increase of quantity and/or quality of empirical information on key indicators. Equally important are the concepts and tools of analysis that systematise and transform information into perceptions relevant for decision-making. The perceptions formed and the decisions, behaviour and actions undertaken are also influenced by the quantitative indicators and measures used in the semantics of discussing the issues, in setting the targets and in following their implementation. The better the analytical framework the greater the information content provided to experts, decision makers, media and general public.

Time is besides money one of the most important reference frameworks in a modern society. The time perspective, which no doubt exists in human perception when comparing different situations, is systematically introduced both as a concept and as a quantifiable measure in statistical and comparative analysis. Expressed in time units it is also an excellent presentation and communication tool understood by everybody.

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COMPARING IN TWO DIMENSIONS

A special category of time distance is related to the level of the analysed indicator: the novel statistical measure S-time-distance measures the distance (proximity) in time between the points in time when the two series compared reach a specified level of the indicator X.

S-time-distance approach is well placed to complement, rather than to replace, the existing mostly static measures of the relative position and thus provide a broader concept to look at the data and to compare situations, improve visualisation, describe scenarios and monitor progress in a truly dynamic conceptual and analytical framework.

This innovation opens the possibility for simultaneous two-dimensional comparisons of time series data: vertically (standard measures of static difference) as well as horizontally (Sicherl time distance), providing a new dimension of analysis to a variety of problems. A new dimension is added while no earlier results are lost or replaced.

The example shows that the perception whether the gender difference in life expectancy in the EU15 is large or small depends on the measure used: static percentage difference is only 8 percent, while S-time-distance amounts to 29 years (the 2000 values for life expectancy for men was attained by women already in 1971). For a more realistic conclusion all measures should be presented simultaneously.

![Static measures of disparity and time distance between life expectancy for females and males for EU15 in 2000](image.png)
Time distance shows how many years earlier (later) the same present level of the indicator for the benchmark unit was achieved in selected countries. As Internet users are growing much faster than GDP per capita, time distances are much smaller.
A PROFILE BETWEEN TWO COUNTRIES FOR MANY INDICATORS

The examples for Sweden and Hungary show how time distance profile of differences between two compared units can present the gap in the time dimension across many fields of concern comparing countries, regions, socio-economic groups, firms, etc.
Comparing 29 OECD countries with the benchmark for three representative indicators clearly shows that, due to wide differences in growth rates across different fields of concern, in a dynamic world it is implausible to rely only on static measures of disparity. They take into account only differences in growth rates between the units, but are insensitive to the absolute magnitudes of the growth rates.

Very different conclusions about the magnitude of the gaps in the two dimensions among different indicators are also observed in comparing 29 OECD countries (see next graph).

- Development and welfare are multidimensional and long-term phenomena. Comparative analysis in attributes has to deal with these characteristics in a meaningful and consistent way.
- The two-dimensional approach shows a novel typology of indicators:
  - type-I processes with long distances in time and short absolute or relative distances (e.g. life expectancy)
  - type-II processes with short time distances and long distances in absolute or relative values (e.g. Internet users per capita)
  - type-III processes with intermediate values of time distances and of absolute or relative distances (e.g. GDP per capita)
- An important question from the point of view of policy is to what extent are the wide differences in growth rates inherent in the nature of some particular attribute and to what extent can they quickly be changed by appropriate policy measures in accord with social objectives.
Comparing the USA and Japan shows very different conclusions about the magnitude of the gaps in the two dimensions for different indicators with different growth characteristics.
EVEN THE RANKING OF DEGREE OF GAP BY INDICATORS IS DIFFERENT

Time distance measure offers a new view of data that is exceptionally easy to understand and communicate, and it allows for developing and exploring new hypotheses and perspectives.

- **Ranking indicators by S-time-distance**
  - The largest time distance is that for the two social indicators where the USA is lagging Japan about 20 years, in sharp contrast to static measures where this advantage for Japan looked very small.
  - The lead of the USA is 16 years for GDP per capita and 20 years for productivity.
  - The lead of the USA for the two information infrastructure indicators is 6 years, i.e. the least in for all indicators, notwithstanding that this was the largest gap when measured by static measures.

- **Ranking indicators by percentage difference**
  - A very large advantage for the USA in information indicators (from 72% to 922%)
  - A substantial advantage for the USA in GDP per capita and GDP per employed (from 35% to 38%)
  - A very small disadvantage of the USA in the selected social indicators (from less than 1% for infant survival to 6% for female life expectancy).

BACKWARD AND FORWARD LOOKING S-TIME-DISTANCE

The first (ex-post) time distance belongs to the domain of statistical measures based on known facts; the second (ex-ante) time distance is important for describing the time distance outcomes of the results of alternative policy scenarios for the future.
Digital divide is one example of the many fields where the novel approach can bring about new understanding and additional elements for analysis and policy discussion. It is also widely applicable beyond comparisons among countries, regions and socio-economic groups. This data set is based on Eurobarometer and SIBIS surveys.
Conventional statistical measures like ratio, percentage, Gini coefficient, Theil index, show the same values for scenario A and scenario B over time. S-time-distance, however, shows value of 10 years in the high growth case and 40 years in the low growth case. It is highly unlikely that people would perceive this as equal degrees of disparity. Taking into account both opens new hypotheses about interrelationship between efficiency, growth and the perception of the overall degree of disparity.

**An additional dimension for measuring relative position and enhanced semantics for policy debate**

- With addition of time distance measure new hypothesis about the interrelationship between efficiency, growth and disparity can be formulated. The analytical conclusion that higher magnitudes of growth rates lead, ceteris paribus, to smaller time distances, and vice versa, is important in explaining past developments and in preparing policy recommendations.

- To improve the present state-of-the-art of socio-economic analysis concepts of the degree of disparity and of convergence and divergence should be measured, evaluated and policy options debated in a broader conceptual and analytical framework. Empirically, it was shown that degree of disparities may be very different in static terms and in time distance.

- While we do not know what subjective weight people assign to the static disparity and time distance in their perception of the overall degree of disparity, both of them matter.

- If one does not use explicitly the broader framework outlined here, there is a possibility that in political debate and policy formulation various interest groups would intentionally look only at the specific statistical measure that will suit their particular interest.
As events are dated in time, the notion of this special category of time distance is a rather natural perspective in time series analysis such as comparison, gap analysis, regressions, models, forecasting, scenarios and monitoring.

**S-TIME-DISTANCE AS A GENERIC STATISTICAL MEASURE**

**Convergence viewed in two dimensions: proximity in time and in space**
(3 x 3 classification of cases)

<table>
<thead>
<tr>
<th>Distance in time</th>
<th>Ratio S-time-distance ↑</th>
<th>Ratio S-time-distance ↑</th>
<th>Ratio S-time-distance ↓</th>
<th>Ratio S-time-distance ↓</th>
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<tr>
<td>2</td>
<td>IRL 1964-1973</td>
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**A NEW VIEW IN TIME COMPARISONS**

I. DESCRIPTIVE STATISTICAL MEASURE

II. a. CONCEPT OF MULTIDIMENSIONAL COMPARISON AND EVALUATION
b. PRESENTATION
c. VISUALIZATION
d. SEMANTICS: POLICY, MANAGEMENT

III. STOCHASTIC MODELS WITH S-TIME-DISTANCE
-e.g. criterion for evaluating forecasting models
(Granger and Jeon, 2003)
GOODNES-OF-FIT AND MONITORING IN TWO DIMENSIONS

For ideas and examples of extensions to measuring deviations between estimated and actual values in regressions and models, forecasting, error in timing and causality, monitoring, business cycle analysis see Sicherl (1994, 1996, 1997), for variables other than time Sicherl (1999). Granger and Jeon (1997, 2003) further elaborated S-distance for the use as a criterion for evaluating forecasting models of leading and lagging indicators.

Consensus forecast and actuals in two dimensions
USA, growth rate of GNP deflator (1973-1985)

Consensus forecast of inflation rate minus actual

Error in timing: S-time-distance in years
CONCLUSIONS

Time distance concept and statistical measure S-time-distance are:
- theoretically universal
- intuitively understandable
- immanently practical

and provide:
- a new perspective to the problem
- an additional statistical measure
- and a presentation tool for policy analysis

Expressed in time units, the time distance measure is readily understood by policy makers, managers, media and general public.

It complements (not replaces) existing measures to provide a broader concept to look at the data and to compare situations.

It is time for asking new questions and exploring new perspectives in a dynamic context.

REFERENCES


Sicherl, P. 2002. The Time Distance among Selected EU and Candidate Countries. 10th General Conference of European Association of Development Institutes, 19-21 September, Ljubljana.

