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How Robust is this Economic Recovery?

Moving beyond qualitative assessments

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ONTONIX
COMPLEXITY MANAGEMENT

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Introduction

After two consecutive quarters of growth in second half of 2009, many experts are predicting the economic recovery is underway in the U.S. But is this recovery sustainable? Can we use available data to measure the robustness of the economic engine? For example, how does the present recovery of 2009 Q4, compare to that of the last one in 2001 Q4?

Problem Statement

The objective of this analysis is to quantify the complexity and robustness of the economy based on well-known economic data and use this information to assess the state of economic health.

Previous Options

“Consumer debt was at a 9-year low at the end of last year [...] big-ticket spending [...] rose at double-digit annualized rates at year’s end”. These statements reflect some of the standard practices for assessing economic health. Thus economists look at a variety of data and piece together a story that is consistent with the different indicators. The problem is that many times there are conflicting signals and a clean call can be hard to make unless one also looks at the GDP growth rate. However, GDP does not always give an indication as to whether the economic expansion or recovery is sustainable or if it is just tentative – a quarter of blistering growth may be immediately followed by a tepid growth.

Ontonix Solution

Using the OntoSpace complexity management tool, 25 different economic indicators are comprehensively combined to yield a single index of economic health based on data complexity. Data comes from

the databases of the Bureau of Economic Analysis, the Bureau of Labor Statistics, St. Louis Fed and other recognized public sources.

Benefit 1 – Economic robustness can be quantified

The complexity metric calculated by OntoSpace is a comprehensive quantification of the state of the economy. The margin between current complexity and the critical complexity level (also calculated) determines the level of robustness of the economy. The robustness calculated is a measure of the vulnerability of the structure of the economy (as represented *solely* by the data considered). High values (>90%) indicate a stable structure – small changes in data will not perturb the structure significantly. Low values of robustness (<70%) indicate vulnerability in the structure – small changes in data can alter the structure quite significantly.

Benefit 2 – Any two periods can be compared

For example, comparison of the robustness of the economy as it stands today to how it was at the end of the last recession can be studied.

Benefit 3 - Key drivers of complexity can be identified

What factors were predominant in the recovery of 2001? What factors are dominating the present recovery? Do the key complexity drivers make intuitive and quantitative sense?

Implementation

Step 1: The following data was collected for every quarter from

1997 to 2009. A total of 52 samples (quarters) of data was collected.

1	Gross domestic product
2	Personal consumption expenditures
3	Goods
4	Durable goods
5	Nondurable goods
6	Services
7	Gross private domestic investment
8	Fixed investment
9	Nonresidential
10	Structures
11	Equipment and software
12	Residential
13	Exports
14	Goods
15	Services
16	Imports
17	Goods
18	Services
19	Government consumption expenditure
20	Federal
21	National defense
22	Nondefense
23	State and local
24	Inflation
25	Unemployment
26	FEDFUNDS rate

Step 2: Data from 16 historical samples (previous quarters) was employed to compute the complexity metrics for any given quarter, starting from the 16th quarter (2000 Q4). This is called the moving window analysis and is automatically setup within OntoSpace. The red box provides data for complexity calculations for the first quarter of analysis (in this case, 2000 Q4), the blue box provides data for the next quarter, and so on. Notice that there is an overlap of 15 samples between the two boxes.

Period	Gross d	Personal c	Goods	Durable	Nondur	Services	Gross priv	Fixed inv	Nonres	Struct
1997Q1	5.1	4.7	5.5	17.9	2.5	9.3	9.7	8	10.6	3.6
1997Q2	6.1	1.6	-0.3	-1.3	0.2	2.7	28.1	8.5	10.3	-3.5
1997Q3	5.1	7	10.9	19.1	6.6	4.8	7.3	16.3	22	16
1997Q4	3.1	4.7	5.6	10.6	2.8	4.1	6.5	3.5	3.3	2.8
1998Q1	3.8	4	3.1	3.4	3	4.5	20.5	12.6	14.6	-4.2
1998Q2	3.6	7.1	10.9	22	5	5	-4.7	14.7	15.5	23.3
1998Q3	5.4	5.4	6.2	12.1	3	4.9	12	7.8	6.2	0.2
1998Q4	7.1	6.3	12.8	25.9	5.6	2.8	13.5	12.8	13.9	-0.6
1999Q1	3.6	4	5.1	1	7.6	3.4	13.2	7.6	9.6	-1.6
1999Q2	3.2	6.4	9.8	20.7	3.8	4.6	-1.4	9.7	11.7	-4.8
1999Q3	5.2	4.9	4.9	10.1	1.9	4.9	10.4	9.6	12	-0.3
1999Q4	7.4	5.8	7.1	5.1	8.5	5	15	2.3	1.3	4.9
2000Q1	1.1	6.2	6.2	24.5	-3.4	6.2	-5.5	12.2	15.7	8
2000Q2	8	3.8	2.2	-7	8.2	4.7	30.7	10.4	15.6	17.6
2000Q3	0.3	4	4.3	7.1	2.7	3.8	-6.1	1.4	4.5	15.9
2000Q4	2.4	3.6	3.6	3	4	3.6	0.2	1.2	1.6	1.7
2001Q1	-1.3	1.6	1	7	2.3	1.9	-19.5	-2.4	-3.8	-10.6
2001Q2	2.6	1.5	1.2	-0.2	1.9	1.7	-1.3	-6.1	-10.1	1.4
2001Q3	-1.1	1.8	3	4.9	2	1.1	-8.2	-4.1	-6.4	2.3
2001Q4	1.4	6.4	15.4	38.1	3.5	1.8	-21.1	-9.7	-12.1	-32.9
2002Q1	3.5	1.4	-0.6	-4.5	1.6	2.6	14.1	-3.5	-9	-20
2002Q2	2.1	2.1	1.9	4.3	0.5	2.1	4.9	-1.5	-6.3	-20
2002Q3	2	2.7	5.2	12.2	1.1	1.4	0.8	-0.7	-2	-16.6

Step 3: OntoSpace calculates the main complexity metrics: complexity, robustness and state of health for each quarter. It also provides information on key drivers of complexity.

Key Findings

The first question we address is **how robust the recovery was as of 2009 Q4**. OntoSpace analysis indicates that the **robustness** of the structure as represented by the 25 economic indicators collected for

Dec 2009: 79%



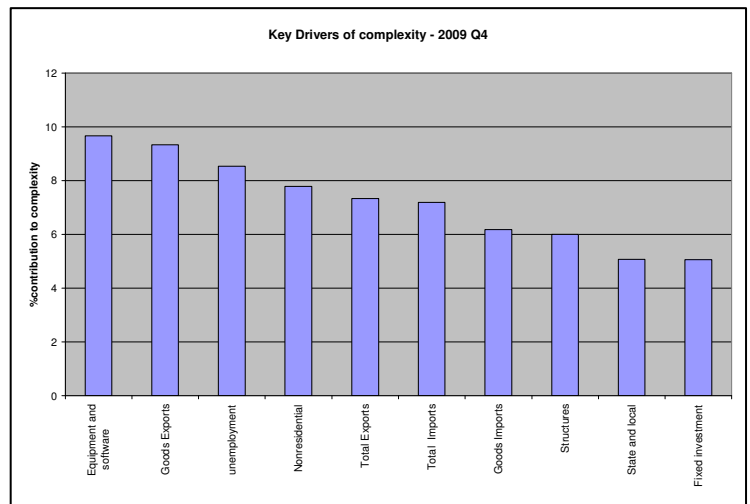
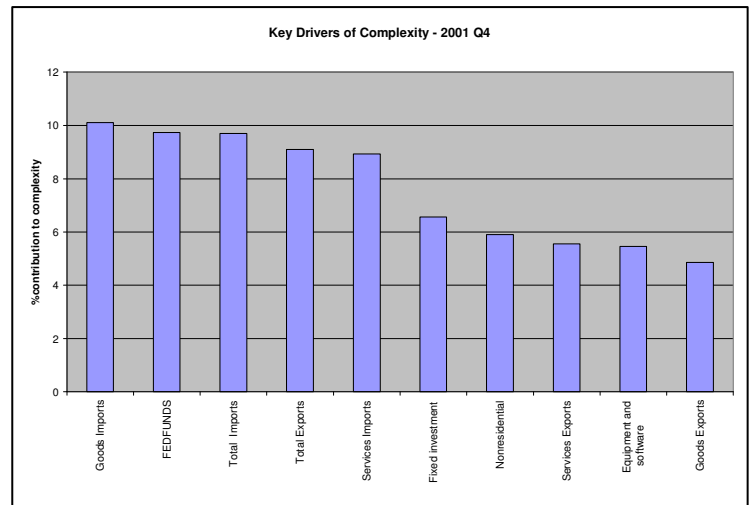
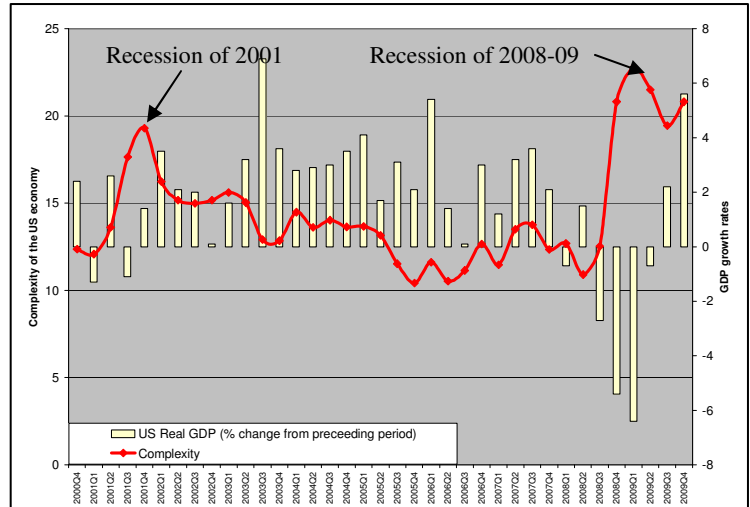
We can now compare this with the results from

Dec 2001: 74%



The robustness of the economy is slightly higher now than it was in 2001 Q4 (last recovery). OntoSpace has assigned a 3-star rating for both recoveries. Importantly, the complexity of the economy now is 9% higher than it was in 2001 Q4. This appears to be a lingering after effect of the crisis of 2008: a 75% increase in complexity occurred between 2008 Q3 and 2008 Q4. Rise in unemployment was a critical factor for this jump.

Another major point of contrast between 2001 and 2009: based on the key drivers of complexity, present recovery seems to be dominated by Equipment and Software and Goods Exports. In 2001, it appeared to be dominated by Goods Imports and Interest rates. Additionally, unemployment still is a big factor in the increased complexity in 2009. This may imply that the Fed's focus now on



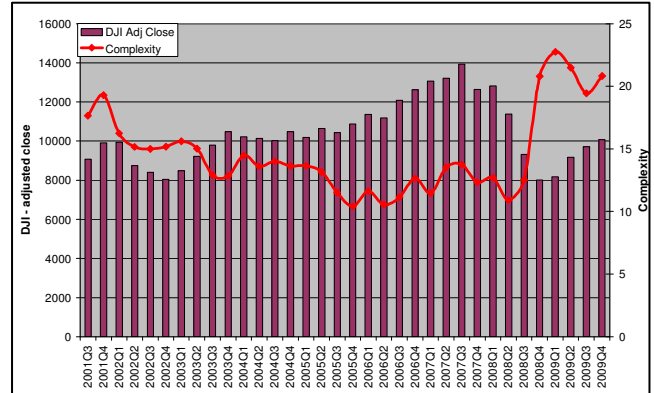
managing the rates is probably not as critical as managing unemployment.

Finally, a juxtaposition of the complexity history with the Dow Jones Industrial (DJI) average shows a strong negative correlation between complexity and DJI. In particular, when complexity jumped between 2008 Q3 and 2008 Q4, DJI dropped in value from 10880 to 8800 (about 20%) followed by another 24% drop in 2009 Q1. In nearly 60% of the quarters considered a drop in complexity was correlated with an increase in DJI and vice versa, signaling that complexity change displays approximately a negative beta with the stock market. Also, for those quarters when DJI swung 10% or more in value from the previous quarter, complexity fluctuations were negatively correlated in 80% of the cases. Complexity monitoring could thus potentially offer valuable insights for investors.

Summary

Complexity analysis of economic data from 1997 to 2009 has provided the following insights:

1. The economy almost doubled in complexity between 2008 Q3 and 2008 Q4
 - a. A big contributor to this increase appears to be unemployment followed by changes in spending on durable goods
2. Economic structure as represented by the data analyzed shows a robustness of 79% at the end of 2009
 - a. This is only slightly better than the economic structure at



the end of the last recession in 2001 Q4.

3. The small spurt of increased complexity between Q3 and Q4 of 2009 implies that there is still some turbulence in the economy and the 2009 Q4 growth may not be entirely sustainable.
4. The real GDP growth for 2009 Q4 was nearly 6%. Based purely on analyzing complexity trends, *we estimate that the growth in 2010 Q1 will not be as high as 2009 Q4* – in other words growth would likely have **slowed** down in Q1 of 2010.
5. Complexity index demonstrates a negative beta to the DJI and could potentially be a useful investment tool.

Please send questions and comments to

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