

# Anticipating Monetary Policy With the Federal Reserve's Beige Book: Re-specifying the Taylor Rule

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*A re-specification of the popular Taylor rule for monetary policy shows that both manufacturing capacity utilization and an index created from the Beige book contribute significantly to predicting changes in the federal funds interest rate, more than traditional estimates of deviations from potential GDP. The Beige book index is also helpful in predicting revisions to the indexes of leading and coincident indicators, showing that it may initially be the more reliable broad-based indicator.*

The Taylor rule<sup>1</sup> postulates that Federal Reserve policymakers react both to realized inflation and to output that is above or below its noninflationary potential. Output growth is a target because when it is stronger than its potential, inflationary pressures build, and when weaker, excess unemployment results. The Taylor rule has been used both to predict and to evaluate actions by the Fed. While a number of studies have noted past problems in its application,<sup>2</sup> and criticized its neglect of forecast information, Judd and Rudebusch (98) find that: “simple Taylor-type reaction functions (how the Fed alters monetary policy in response to economic developments) were found to perform almost as well as optimal, forecast-based reaction functions that incorporate all the information available in the models examined. In addition, the simple specification was found to perform almost as well as reaction functions that explicitly include a variety of additional variables. These results appear to be fairly robust across a variety of macroeconomic models. Thus, the general form of the Taylor rule may be a good device for capturing the key elements of policy in a variety of policy regimes.”<sup>3</sup>

The Taylor rule-type approach should work well for the business economist who wants a simple method to anticipate interest rate changes initiated by the Federal Reserve, because it

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<sup>1</sup> See Taylor (93).

<sup>2</sup> See Orphanides (97), and Kozicki (99).

<sup>3</sup> Judd and Rudebusch (98), p. 4.

links those changes directly to data, instead of to model forecasts. The main result of this paper is that, in the Taylor rule, changes in the federal funds interest rate (the rate most influenced by the Fed) are better explained using the manufacturing capacity utilization rate and an index derived from the Beige book in the place of traditional estimates of deviations from potential GDP. (The “Beige book” is the popular name given to the Federal Reserve’s anecdotal survey of conditions in each of the twelve Federal Reserve bank districts. It is conducted eight times a year, and is released about two weeks prior to meetings of the Federal Reserve Open Market Committee, or FOMC.)<sup>4</sup>

It is easy to see why the Fed might treat capacity utilization as an indicator of inflationary pressures, but why the Beige book? To make matters even more mysterious, it is not clear that the FOMC pays all that much attention to the Beige book. The Beige book generally gets a perfunctory mention in the published minutes of FOMC meetings along with many other data releases, and has never been mentioned as a supporting factor in the policy directive that is issued following the meeting. The major non-financial items in the Beige book, like manufacturing production, construction, and retail sales, are all covered in other major releases which come out monthly.

### **Advantages of the Beige book**

Yet, the Beige book does have several advantages not found in any other data release. First, it summarizes all the relevant information about the economy just prior to the FOMC meeting. There is no other statistical measure or report more frequent than quarterly GDP that reproduces the Beige book’s breadth, with the possible exception of the Conference Board’s monthly economic indicators. Each Beige book has a national summary that boils down the state of the economy to just one sentence, such as this one from the June 14, 2000 report: “Reports

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<sup>4</sup> For a more detailed description of the Beige book, see Balke and Petersen (98), p. 3.

from the Federal Reserve Districts indicate that solid economic growth continued in April and May, but that signs of some slowing from the rapid pace earlier in the year are also present.” In addition, each of the twelve district reports usually has a similar summary sentence for that district. The process that the writers go through in reducing a large amount of information to a single sentence with a modifying adjective or two (such as “solid, but slowing”) likely mirrors the same process the FOMC must use, because ultimately FOMC decisions come down to a simple choice: change the rate and choose the amount, or stand pat.

Second, the summary sentences in the Beige book are inconsistent in that sometimes they focus on the level of growth, and sometimes on the change in the growth rate. However, this is actually an advantage in that this focus on the “news of the moment” is more likely to reproduce the concerns of the FOMC.

Third, the Beige book is the only report whose timing is directly tied to the FOMC meetings. The FOMC meets eight times a year at irregular intervals of 5 to 8 weeks. The Beige book report is always released roughly two weeks prior to the meeting, so the survey itself represents the state of the economy roughly 4-6 weeks prior to each meeting. There will be times when other monthly reports will contain more recent information than the Beige book, but none will do so consistently.

Finally, the Beige book data are never revised, so it represents a view of the economy as it was perceived at the time. Orphanides (97) and Evans (98) have pointed out that it can make a difference in monetary policy regressions whether one uses the same data that was available to the Fed decision-makers at the time. “As reported” databases have been compiled, but may be difficult to obtain.

## Methodology Problems

Despite these advantages, there are some important obstacles to translating the material in the Beige book into a quantitative data series that can be used in a regression. The most obvious difficulty is that the Beige book is a largely textual compilation of anecdotes and subjective evaluation. Some percent change numbers for various items are reported, but there are none that could represent the whole. Therefore, a methodology is required to translate the textual essence of each report into a single number. The most obvious approach is to read the whole of the report each time, subjectively evaluate the mixture of reported strengths and weaknesses in the economy, and assign it a score that reflects the relative standing of this report compared to all others. This is the approach taken by two recent studies of the Beige book.<sup>5</sup>

To achieve some consistency of scoring using this approach, however, the researcher must read all the Beige books “blind” (without knowing the date of each report) so as to prevent hindsight knowledge from contaminating scores. Also, all of the reports must be read at the same time, so as to minimize changes in the subjective mental scale that is being applied. Even doing all this can still allow a fair amount of inconsistency in scoring between researchers. In Balke and Petersen (98), the two authors achieve a correlation of .75 when individually evaluating the national summary for current quarter output growth.<sup>6</sup> In Fettig, Rolnick, and Runkle (99), the correlations between pairs of each of the three authors are .75, .73, and .68 in evaluating the level of output, but only .66, .56, and .43 for scores of output growth. Another weakness of this

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<sup>5</sup> Balke and Petersen (98) find that their Beige book indices have significant predictive content for current and next quarter real GDP growth, even when the Blue Chip forecast is included in the regression. Fettig, Rolnick, and Runkle (99) find the opposite, that private sector forecasts are superior to the Beige book in explaining current quarter real GDP growth.

<sup>6</sup> Aggregating scores for individual districts into one number for the report boosts the correlation to .91 because some differences in district scores between the two authors are offset.

approach is that updating the data series for new Beige books at a later time would allow even more inconsistency, unless the entire process is repeated.

A narrower, but more easily updateable and probably overall more consistent approach is the one taken in this paper. Given the summary statements in each of the Beige books described above, we can take advantage of the almost standardized formats of these statements and assign scores to the strength of the modifying adjectives used in these summaries, based on a pre-determined list of word values. For example, the June 14, 2000 adjectives of “solid, but slowing” would seem to indicate a strong but decelerating economy, so that the FOMC would likely not react by changing interest rates. Thus, an appropriate scoring would seem to be to give the word “solid” a +1 score to indicate a strength of the present economy, the word “slowing” a –1 score to indicate a present weakness, and then average the two for a net score of zero. The zero score would be interpreted as predicting that the FOMC will stand pat. A +1 score would indicate a bias to raising rates, a –1 score a bias to lowering rates.

Because the list of word values is determined ahead of time (all “solid” references will be scored +1, all “slowing”s as –1), a high degree of consistency between researchers can be achieved. The only role for subjectivity is that researchers may disagree on the numerical score to assign to these modifying adjectives. One way to deal with this problem is to avoid splitting hairs by limiting the number of different scores possible to five or less. However, any differences will likely be systematic over time, so that the change in the series will be consistent. It will not matter in the regression if the FOMC neutral bias point is some number other than zero.

To demonstrate that the relative strength of adjectives used to describe the economy can be related to objective reality over time in a meaningful way, the table below shows the results of each FOMC meeting since the Beige book was started in 1983. The second column shows the

directed change, if any, in the Fed’s open market desk reserve position. The third column lists changes made to the discount rate. The fourth is the “bias” position to be taken between meetings. The last column gives the key adjectives from the opening sentence of the Fed’s monetary policy directive, which is a summary description of the state of the economy at the time.<sup>7</sup> These modifiers are different than the ones in the Beige book national or district summaries, but show enough correlation with the index we will construct to make it a useful illustration.

### A 17-year History of FOMC Monetary Policy Directives

Meeting date	Reserve position	Discount rate	Inter-meeting bias	Description of economy
07/13/83	Tightened		No bias	Strengthened pace
08/23/83			No bias	Rapid growth
10/04/83	Loosened		No bias	Rapid, but moderated
11/15/83			Tightening bias	Rapid
12/20/83			Tightening bias	Rapid
01/31/84			Easing bias	Moderated more
03/27/84		+½ point	Tightening bias	Accelerated
05/22/84			No bias	Moderating, yet rapid
07/17/84			Tightening bias	Strong pace
08/21/84			No bias	Moderation
10/02/84	Loosened		Easing bias	Slowed appreciably
11/07/84	Loosened	-½	Easing bias	Cont. slower growth
12/18/84	Loosened	-½	Easing bias	Cont. slower growth
02/13/85			No bias	Moderate pace
03/26/85			No bias	Slower
05/21/85		-½	Easing bias	Modest pickup
07/10/85			Tightening bias	Some pickup
08/20/85			No bias	A little faster
10/01/85			No bias	Moderately faster
11/05/85			Easing bias	Modest pace
12/17/85	Loosened		Easing bias	Modest pace
02/12/86		-½	No bias	Moderate pace
04/01/86		-½	No bias	Pickup (oil prices fall)
05/20/86			Tightening bias	Modest pace
07/09/86	Loosened	-½	No bias	Slow

<sup>7</sup> Since the Feb. 2, 2000 meeting, the directive has omitted this summary description. However, such a sentence can still be found in the main body of the text of the FOMC minutes, published in the *Federal Reserve Bulletin* and at the Fed’s website.

08/19/86	Loosened	-1/2	No bias	Expanding moderately
09/23/86			Tightening bias	Pickup from slow
11/05/86			No bias	Moderate pace
12/16/86			No bias	Moderate pace
02/11/87			Tightening bias	Moderate pace
03/31/87			Tightening bias	Faster pace
05/19/87	Tightened		Tightening bias	Moderate pace
07/07/87			No bias	Moderate pace
08/18/87			Tightening bias	Moderate pace
09/22/87	Tightened	+1/2	No bias	Moderate pace
11/03/87	Loosened		Easing bias	Brisk (stock market crash)
12/16/87			No bias	Moderated
02/10/88	Loosened		No bias	Rapid but weakening
03/29/88	Tightened		No bias	Sharp pickup
05/17/88			Tightening bias	Strong
06/30/88	Tightened		Tightening bias	Vigorous
08/16/88		+1/2	Tightening bias	Vigorous
09/20/88			Tightening bias	Moderated
11/01/88			Tightening bias	Moderated previously
12/14/88	Tightened		Tightening bias	Vigorous
02/08/89		+1/2	Tightening bias	Vigorous
03/28/89			Tightening bias	Appreciable expansion
05/16/89			No bias	Slowed
07/06/89	Loosened		No bias	Slowed previously
08/12/89			Easing bias	Moderate pace
10/03/89			Easing bias	Moderate pace
11/14/89			Easing bias	Moderate pace
12/19/89	Loosened		No bias	Slow
02/07/90			No bias	Mixed
03/27/90			No bias	Some pickup
05/15/90			No bias	Moderate pace
07/03/90			Easing bias	Slow
08/21/90			Easing bias	Cont. slow
10/02/90			Easing bias	Slow
11/13/90	Loosened		Easing bias	Weakening
12/18/90	Loosened	-1/2	Easing bias	Still weakening
02/06/91		-1/2	Easing bias	More weakening
03/26/91			No bias	Ditto
05/14/91		-1/2	No bias	Mixed
07/03/91			No bias	Begun to recover
08/20/91			Easing bias	Moderate pace
10/01/91		-1/2	Easing bias	Moderate pace
11/05/91	Loosened	-1/2	Easing bias	Sluggish
12/18/91		-1	Easing bias	Sluggish

02/05/92			Easing bias	Sluggish
03/31/92			Easing bias	Strengthening
05/19/92			No bias	Moderate pace
07/01/92		-1/2	No bias	Moderate pace
08/18/92			Easing bias	Subdued pace
10/06/92			Easing bias	Subdued pace
11/17/92			Easing bias	Moderate pace
12/22/92			No bias	Rising appreciably
02/03/93			No bias	Rose previously
03/23/93			No bias	Moderated
05/18/93			Tightening bias	Slowed
07/07/93			Tightening bias	Picked up
08/17/93			No bias	Moderate pace
09/21/93			No bias	Moderate pace
11/16/93			No bias	Strengthened
12/21/93			No bias	Strong
02/04/94	Tightened		No bias	Further gains
03/22/94	Tightened		No bias	Appreciable expansion
05/17/94	Tightened	+1/2	No bias	Expanded substantially
07/06/94			Tightening bias	Substantial gain
08/16/94	Tightened	+1/2	No bias	Substantial but moderated
09/27/94			Tightening bias	Substantial
11/15/94	Tightened	+3/4	No bias	Substantial
12/20/94			Tightening bias	Pickup
01/31/95	Tightened	+1/2	No bias	Strong
03/28/95			Tightening bias	Moderated
05/23/95			No bias	Slowed
07/06/95	Loosened		No bias	Slow
08/22/95			No bias	Strengthening
09/26/95			No bias	Moderate pace
11/15/95			No bias	Moderation
12/19/95	Loosened		No bias	Substantial slowing
01/31/96	Loosened	-1/4	No bias	Growing slowly
03/26/96			No bias	Picked up
05/21/96			No bias	Moderate pace
07/03/96			Tightening bias	Advanced considerably
08/20/96			Tightening bias	Moderated
09/24/96			Tightening bias	Moderated appreciably
11/13/96			Tightening bias	Slowed substantially
12/17/96			Tightening bias	Moderate pace
02/05/97			Tightening bias	Strengthened markedly
03/25/97	Tightened		No bias	Strong
05/20/97			Tightening bias	Slowed
07/02/97			Tightening bias	Slowed substantially

08/19/97			Tightening bias	Moderate pace
09/30/97			Tightening bias	Brisk
11/12/97			Tightening bias	Rapid growth
12/16/97			No bias	Rapid growth
02/04/98			No bias	Rapid growth
03/31/98			Tightening bias	Rapid growth
05/19/98			Tightening bias	Rapid growth
07/01/98			Tightening bias	Slowed considerably
08/18/98			No bias	Robust pace
09/29/98	Loosened ¼ point	-¼	Easing bias	Moderate pace
11/17/98	Loosened ½	-¼	No bias	Moderation
12/22/98			No bias	Brisk
02/03/99			No bias	Rapid growth
03/30/99			No bias	Robust
05/18/99			Tightening bias	Vigorous
06/30/99	Tightened ¼		No bias	Vigorous
08/24/99	Tightened ¼	+¼	No bias	Solid
10/05/99			Tightening bias	Substantial
11/16/99	Tightened ¼	+¼	No bias	Solid
12/21/99			No bias	Strong
02/02/00	Tightened ¼	+¼	Tightening bias	Vigorous
03/21/00	Tightened ¼	+¼	Tightening bias	Rapid
05/16/00	Tightened ½	+½	Tightening bias	Robust
06/27/00			Tightening bias	Moderating
08/22/00			Tightening bias	Moderating

Skimming the table ought to reveal that when the modifiers in column 5 are synonyms for a strong or strengthening economy, the Fed often either tightened or took a tightening bias, and vice versa when the adjectives indicated a weak or weakening economy. Other modifiers could be described as more neutral, such as “moderate pace,” that might be associated with inaction by the Fed or a neutral policy bias. It is also interesting to note that the modifiers tend to be leading indicators. The Fed often appears to wait until strong or weak conditions have persisted for several meetings in a row before taking action. These observations form the basis for our use of similar modifiers from the Beige book reports as an index series in a monetary policy regression later.

Another potential inconsistency is that the authors of the Beige books will change over time, and the way different authors use a word can vary. After reading through all the Beige book summary sentences, it is this author's judgment that there is widespread agreement among American English language speakers as to the relative strength of commonly used adjectives, and which can be treated as interchangeable. Therefore, problems from differing usage are likely to be small.

A further innovation in our methodology that should limit the effect of any inconsistencies is to create a diffusion index<sup>8</sup> from the summary sentences of all twelve district reports in each Beige book, instead of relying solely on the writer of the national summary. Totalling up twelve district scores with twelve different authors reduces the chance that the idiosyncrasies of any one writer, or the replacement of a writer, will affect the overall score in a significant way.

A final obstacle is one of timing. The variable timing of the Beige book and its eight-times-a-year frequency make it difficult to compare its usefulness as an indicator to other data releases, which tend to be monthly or quarterly. Our solution to this problem will be the same as that taken in Balke and Petersen (98),<sup>9</sup> which is to assign Beige book reports to individual months if the reported closing date for that issue (approximately one week prior to the release date) is later than the 15<sup>th</sup> of the month. A report with a closing date earlier than the 15<sup>th</sup> is assigned to the previous month. For completeness, any month without a Beige book is assigned the value of the preceding month. Given that the Beige book represents information

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<sup>8</sup> A diffusion index aggregates different data, either numerical series or survey responses, into one number by assigning equal weights to each component. Therefore, a diffusion index is primarily a measure of breadth, not depth. Examples are the National Association of Purchasing Managers' Index and the Conference Board economic indicators (the latter also incorporates a depth element). However, comparisons of pure breadth diffusion indexes such as the NAPM price index with percent changes in related variables, such as core intermediate goods producer prices from the Bureau of Labor Statistics, show that measures of breadth and depth are often closely correlated. See Pesaran (88), section 8.3, for a theoretical justification of this result.

<sup>9</sup> See Table A1 in Balke and Petersen (98) for a list of Beige book issues and the months they were assigned to.

approximately 4-6 weeks prior to the release date, this will be a conservative dating scheme because a report will not receive a monthly date prior to the date of its contents, though a report could receive a date later than its contents would warrant. This will prevent any unfair advantage being given to the Beige book when its predictive power is compared with that of other monthly data.

### **Constructing the Index**

Of the 1,656 district reports since the Beige book was released in mid-1983,<sup>10</sup> all but 89 have included a sentence with an assessment of the overall state of conditions in the district. In the last eight years, only 9 out of 780 have lacked such a sentence. Each sentence contains a keyword that relates to the overall economy in the subject or direct object position of the sentence. The most common keywords have been “economy” (526 references), “activity” (445), “conditions” (196), and “growth” (150). The other 339 summary sentences refer to either “expansion,” “recovery,” “developments,” “sectors,” “indicators,” “trend,” or “reports.” Each sentence also generally includes adjectives and other description which serve as modifiers to these keywords. The modifiers are assigned a score between +1 and -1. In the scoring scheme of this paper, half-points are allowed, so that the total number of categories is five (-1, -½, 0, ½, 1). Scoring categories could be simplified to three, or expanded to seven or more, though expansion runs the risk of greater inconsistency by assuming the report writers used adjectives with greater precision than perhaps they intended. Also, it is likely that widespread agreement on word rankings can be achieved only if the number of categories are kept to five or less.

The table below lists the most commonly used modifiers, and accounts for 80% of the roughly 1,800 modifiers used. The number of modifiers exceeds the number of reports because

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<sup>10</sup> From 1970 until mid-1983, the district survey of economic conditions was called the “Red book” and kept confidential.

two modifiers are used in the summary sentence of some reports. When this happens, both modifiers are scored and averaged. When a summary sentence is lacking, a score is assigned based on a reading either of the report's first sentence or its introductory section. Scores are assigned to comments about current and local conditions only. References to expectations, outlook, or comparisons to the national economy are ignored.

### Modifiers With More than 10 References, 1983-2000

<u>Modifier</u>	<u># times</u>	Assigned <u>value</u>	<u>Modifier</u>	<u># times</u>	Assigned <u>value</u>
Expand/moderate expansion	147	½	High level	26	1
Growth/moderate growth	131	½	Slight improvement	24	*
Slower/slowing/slowed	122	-1	Good	23	1
Mixed	121	0	Increase(d)	20	½
Strong(er)	104	1	Moderated	20	-½
Improve(d)(ment)	96	1	Modest improvement	19	*
Slow growth/expansion	74	0	Eas(ed)(ing)	17	-1
Weak(en)(ened)(ness)	69	-1	Uneven growth/expansion	16	0
Sluggish	52	0	Flat	15	0
Modest growth/expansion/pace	47	0	Brisk	15	1
Healthy/h. growth	46	½	Robust	13	1
Strength(en)	40	1	Steady/stable growth	12	½
Positive	33	1	Stable	12	0
Soft(en)(ened)(ening)	33	-1	Slightly slower	12	*
Pick(ed) up	31	1	Favorable	11	1
Solid/s. growth	29	1	(Miscellaneous)	<u>371</u>	
			TOTAL	1,818	

\* Previous trend is assumed

The word scores in the above table are assigned according to the following rule: if the modifier indicates the economy is either booming or improving, it receives a +1 score. One-half point is assigned for moderate growth, zero for slow growth or conflicting trends between sectors, -½ for a low level of activity or a small change for the worse, and -1 if it indicates the economy is weak or weakening. Notice that references to changes in the growth rate are scored the same as if it was the growth rate itself (“weak” = “weakening” = -1). The rationale is that,

according to the Taylor rule, either one could provide an incentive to the Fed to change its current policy stance.

“Slight/modest improvement” and “slightly slower” are not given a score in the table. There are 107 reports which used the word “slight,” “modest, or “marginal” as a preface to the modifier. It did not seem fair to give these references even half-point scores, so they are ignored instead, and the previous trend is assumed to continue. Modifiers which are prefaced by the words “gradual,” “slow,” or “mild” are given half-credit. Those that are prefaced by “some” or “somewhat” still get full credit.

In a number of summary sentences, and in all but 16 of the 89 reports which are missing such sentences, modifiers describing a specific economic sector are used. The rule of thumb to use here is that if the sector is either manufacturing/industrial, retail/consumer, or employment, the modifier still gets full credit.<sup>11</sup> Any other sector, such as energy, natural resources, housing, or agriculture is ignored. If two full-credit sectors are mentioned, the modifiers are averaged.

In the 16 cases where no usable data is available, the previous trend is assumed. Modifiers which are used to describe the effects of weather-related conditions are ignored, since we (and the Fed) are interested in the underlying trend. In 1992-94, conditions in the 12<sup>th</sup> district diverged between California and the other states, so the modifiers applied to each state are weighted by the share of their gross state product in the total.<sup>12</sup> Finally, common sense must be used. “Few signs of slowing” should be scored as +1, not -1. The researcher should always check to see if a straight-forward application of the scoring rules would violate the obvious intent of the report author.

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<sup>11</sup> Double-counting must be avoided, however. For example, in the reference “overall mixed- retail sluggish,” to give a score to both “mixed” and “sluggish” would double-count the retail sector, since it’s sluggishness is probably responsible for the modifier “mixed” being used.

<sup>12</sup> California 66%, Washington and Oregon 15%, mountain states 13%.

After word scores are assigned, the index is constructed by simply summing the district scores into one number, which can range from -12 to +12, to represent the whole report. Each district value is given equal importance, even though district sizes are different. Weighting the district scores by the relative value of their respective gross state products was tried, but this did not greatly change the numbers, and did not improve index performance during data analysis.

### **Data Analysis**

Correlation of the Beige book index with other variables will not prove that the index is meaningful, but it may show what its information content is most similar to. The table below shows the best correlations of the index with other quarterly economic data series from 1983 to the present.

#### **Beige Book Index Correlations, 1983:2-2000:2**

Real GDP, % change	.66	Real GDP, % chg, advance release (as reported)	.67
Nominal GDP, % chg	.54	Coincident indicators, % chg	.78
Manufacturing production, % chg	.74	Coin. ind. % chg, as reported	.67
Capacity utilization, chg	.60	Leading indicators, % chg	.56
Unemployment rate, chg	-.63	Lead. ind., % chg, as reported	.50

The Beige book index has its greatest correlation with the percent change in the coincident indicators and the percent change in manufacturing production. This is not surprising, as industry performance is often given top billing in the district reports. The index apparently does well in overlooking purely nominal changes in that its correlation is stronger with real GDP than nominal GDP. It has a higher correlation with real GDP as initially reported than with revised real GDP (the difference is greater in most other sample periods). This is also not surprising given that the Beige book data are never revised, and reflect conditions as they were perceived at the time. However, it is surprising that the Beige book index is better correlated with the revised coincident and leading indicators than the indicators as reported at the time. Thus, the

BBI may actually be the better initial indicator. The following regressions show that the BBI helps to predict the percent change in the revised coincident and leading indicators:

	<u>Dependent variable, 83:3-00:2</u>	<u>R<sup>2</sup> adj.</u>	<u>Std error</u>	<u>Explanatory variables</u>	<u>t-stat</u>
(1)	Coincident indicators, % change	.84	.80	Lagged dependent variable	2.4
				As reported coincident indicators, % change	4.8
				Beige book index (BBI)	5.6
(2)	Leading indicators, % change	.60	.98	As reported leading indicators, % change	5.3
				Change in the BBI	5.6
				BBI lagged one period	1.7

The change in the Beige book index works the best in the leading indicators regression, as the change in the leading index tends to be associated with changes in the acceleration of economic growth (the second derivative of the economy),<sup>13</sup> while the change in the coincident index is associated more with changes in the growth rate. However, the 0.56 correlation of the BBI with the leading index in the table on the previous page shows that the BBI level may contain a fair amount of information on growth acceleration as well as the growth rate itself. This is to be expected, since we constructed our index so as to include both types of information.<sup>14</sup>

### **The Beige Book as a Predictor of Monetary Policy**

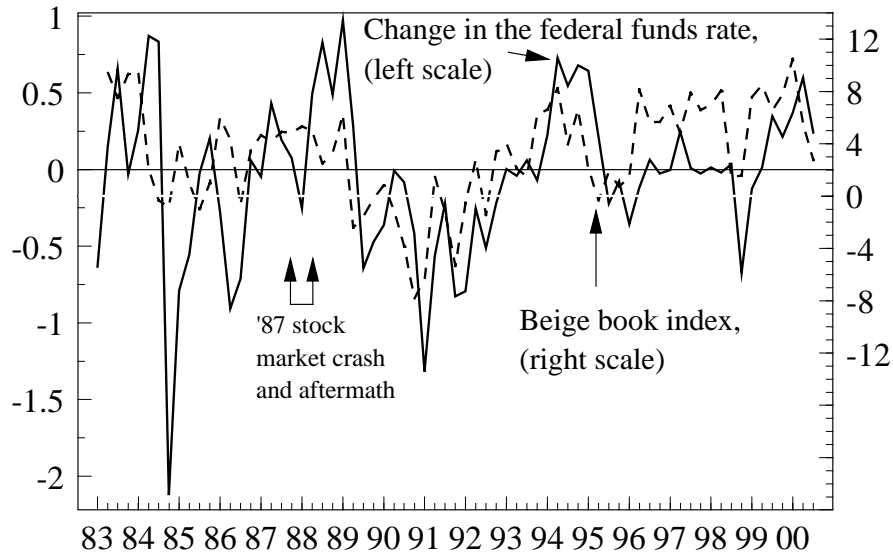
The following chart provides the basis for our interest in the Beige book index as a predictor of monetary policy. It shows a good correlation between our Beige book measure averaged quarterly, and the quarterly change in the federal funds rate, especially after 1988.

<sup>13</sup> While the percent change in the coincident index is correlated .91 with the percent change in manufacturing production (one of its components), the percent change in the leading index is correlated only .52 with production's percent change, but .63 with the change in its percent change.

<sup>14</sup> When the BBI is revised to focus on information on growth acceleration only, the correlation with the percent change in the leading index rises to .81 and it dominates the "as reported" leading index in regression 2.

## The Beige Book and the Federal Funds Rate

### Quarterly



Some reasons for periods of non-congruence between the two series can be offered. In 1984, the Fed held off lowering rates until late in the year because of an inflation scare in the long bond market, according to Marvin Goodfriend.<sup>15</sup> The cuts in the rate in early 1986 are likely related to the large drop in energy prices that reduced inflation and caused trouble for energy-sensitive regions of the country. The zigzag in late 1987-early 1988 is almost certainly a reaction to the stock market crash in October 1987, and the resumption of normality thereafter. In 1996-99, the difference in levels may be related to Greenspan's decision that rising productivity had raised the speed limit of the economy.<sup>16</sup> All of these past examples of divergence show why the Beige book index should not be solely relied upon, but used as one explanatory variable among several when doing a federal funds rate regression.

<sup>15</sup> Goodfriend (93), p. 14.

<sup>16</sup> See "Greenspan Resisted Efforts at Fed to Lift Rates Last Year and Then in February," *Wall Street Journal*, March 28, 1997. Greenspan's speeches since 1996 have generally included the notion that a higher productivity trend has raised the non-inflationary growth rate.

Our first test of the index's predictive ability is to match it to the change in the federal funds rate after a Beige book has been released. To make the data comparable, we will define the dependent variable to be the average weekly rate from the most recent Beige book release date to the next release date, less the average rate from the previous Beige book release to the current release. Regression 3 below shows that both the lagged dependent variable and the current Beige book release have explanatory power for the change in the funds rate after the release.

Regression 4 confirms what the chart above illustrates, that the Beige book did better after Alan Greenspan's term began. This regression starts with the fourth Beige book release in mid-1988 to avoid the effects of the stock market crash on the funds rate.

	<u>Dependent variable</u>	<u>R<sup>2</sup> adj.</u>	<u>Std error</u>	<u>Explanatory variables</u>	<u>t-stat</u>
(3)	Change in the federal funds rate by Beige book period, 1983:6-2000:4	.34	.27	Lagged change in funds rate Previous Beige book release	4.8 4.8
(4)	Change in the federal funds rate, 1988:4-2000:4	.62	.16	Lagged change in funds rate Previous Beige book release	6.4 5.9
(5)	Change in the federal funds rate, 1989:5-2000:4	.67	.14	Previous Beige book release Change in fed funds futures price Same, lagged one period	5.3 -4.4 -3.2

Although the Beige book index does have explanatory power in these regressions, a key issue is whether that power continues to be significant once other variables are added.

Unfortunately, because of the irregular frequency of the Beige book, only variables with either daily or weekly frequencies can be aggregated to the period of the Beige book. One such candidate proposed in Evans (98) is the one-month ahead federal funds rate futures contract price, available at daily frequency since late March of 1989. This represents the market's best guess as to the future path of the federal funds rate, and should incorporate the best available information from all sources at the time. In regression 5 above, the change in the futures price is added as a competing explanatory variable. The average of the daily price the same week as the

Beige book release is used. This should be a conservative test because the information in the Beige book report is already somewhat out-of-date by then.

Regression 5 shows that the Beige book still retains explanatory power after the inclusion of the one-month ahead fed funds futures contract prices. (The lagged dependent variable was not significant this time.) However, to test the BBI against other variables will require aggregating our index to a quarterly frequency, which we consider in the next section.

### **The Taylor Rule**

The Taylor rule provides a framework for our monetary policy regression which is similar to that found in Judd and Rudebusch (98). In Taylor (93), the level of the nominal federal funds rate equals the rate of inflation plus an “equilibrium” real funds rate (one that is consistent with full employment) plus an average of two gaps: 1) the four-quarter moving average of actual inflation of the GDP deflator less a target rate, and 2) the percent deviation of real GDP from an estimate of its potential level:

$$i_t = \pi_t + r^* + 0.5(\pi_t - \pi^*) + 0.5(y_t)$$

where  $i$  = federal funds rate  
 $r^*$  = equilibrium real federal funds rate  
 $\pi$  = average inflation rate over the contemporaneous and prior three quarters  
 $\pi^*$  = target inflation rate  
 $y$  = output gap (100\*(real GDP–potential GDP)/potential GDP)

Subtracting  $i_{t-1}$  from both sides of the equation converts it to an error correction form. Judd and Rudebusch use this format with interest rate smoothing behavior by the Fed to obtain an equation (their equation 4)<sup>17</sup> with the change in the federal funds rate explained by the lagged change in the funds rate, the lagged level of the funds rate (its coefficient should be negative), the average inflation rate, and the output gap. If the data is available, the output gap should be the gap as

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<sup>17</sup> Judd and Rudebusch (98), pp. 5-7. Their article is available at the Federal Reserve Bank of San Francisco’s website at [www.frbsf.org/econsrch/econrev/index.1998.html](http://www.frbsf.org/econsrch/econrev/index.1998.html).

reported at the time, before any later GDP revisions.<sup>18</sup> The unknown  $r^*$  and  $\pi^*$  are subsumed in the constant term.

Given that Judd and Rudebusch find the parameters of the Taylor rule change when the Federal Reserve chairmanship changes hands, we estimate our monetary policy regression for the Greenspan period only, starting in the second quarter of 1988 so as to avoid the effects of the stock market crash. We will first estimate the rule using the output gap as the measure of tightness or looseness of economic capacity, and then add manufacturing capacity utilization and our Beige book index. Finally, we will add to this regression, one-at-a-time, a number of macroeconomic variables that could be competitors to the Beige book for explaining changes in the federal funds rate.

Regression 6 below shows that all the variables in Judd and Rudebusch's equation are strongly significant. The adjusted  $R^2$  (when run over their original period 1987:3-97:4) is .74 compared to their reported .67,<sup>19</sup> indicating the advantage of our having used "as reported" data for the output gap variable.

	<u>Dependent variable, 88:2-00:2</u>	<u>R<sup>2</sup> adj.</u>	<u>Std error</u>	<u>Explanatory variables</u>	<u>t-stat</u>
(6)	Change in the federal funds rate	.71	.25	Lagged change in funds rate	3.6
				Lagged level of the funds rate	-6.5
				4-qtr average % change in the GDP deflator	5.1
				As reported output gap	6.7

<sup>18</sup> The "as reported" output gap in our regressions is imperfect, given the current lack of data availability. In our measure, the Fed's own potential output data series as of 1993 is extrapolated and used for the 1988-95 period. Congressional Budget Office (CBO) potential output data as of 1998 are used for 1996-97, and CBO data as of July 2000 (but before the BEA's annual GDP revision) are used for 1998-2000.

<sup>19</sup> See Judd and Rudebusch's Exhibit 1, regression B, p. 9.

	<u>Dependent variable, 88:2-00:2</u>	<u>R<sup>2</sup> adj.</u>	<u>Std error</u>	<u>Explanatory variables</u>	<u>t-stat</u>
(7)	Change in the federal funds rate	.76	.22	Lagged change in funds rate	1.3
				Lagged level of the funds rate	-6.8
				4-qtr average % change in the GDP deflator	4.5
				As reported output gap	5.4
				Manufacturing capacity utilization	3.4
(8)	Change in the federal funds rate	.80	.20	Lagged level of the funds rate	-5.6
				4-qtr average % change in the GDP deflator	5.1
				As reported output gap	-0.0
				Manufacturing capacity utilization	5.8
				Integrated Beige book index	3.4

Capacity utilization is another measure that is commonly used to estimate how close the economy is to its non-inflationary productive capacity. Manufacturing capacity utilization<sup>20</sup> proves to be significant when added in regression 7. The lagged dependent variable becomes insignificant at this point, implying that the Fed's smoothing behavior can be represented by other variables as well.

In regression 8 we add a form of our Beige book index for the first time. Interestingly, the significance of the output gap measure drops to zero, as apparently both manufacturing capacity utilization and the BBI represent all of the explanatory power of the output gap measure. The BBI used in regression 8 is an integrated form of our constructed index. In the correlations table previously, we saw that the BBI was most associated with changes in other data series as opposed to their levels. Yet, the output gap is a level term. Therefore, the constructed BBI is used as the change form of an integrated series, which is compiled by assigning it a starting value of 1.0 prior to the first Beige book report.

We can insert change variables into the above error correction form of the Taylor rule by adding and subtracting a lagged term in levels to any of the explanatory variables in the equation.

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<sup>20</sup> The "as reported" manufacturing capacity utilization series was also tried, but did not improve the fit, probably because breaks in the data series caused levels over time to be non-comparable.

For example, adding and subtracting the level of capacity utilization at time t-1 would result in both the change of the utilization rate at time t and the level of the rate at time t-1 as explanatory variables, with an expected negative coefficient on the lagged level. Adding and subtracting integrated “level” terms for the BBI for both time t-1 and t-2 gives us an equation with the current and lagged values of the BBI as explanatory variables, along with the integrated index at time t-2. Regression 9 below shows that two of these three terms are significant for the time period 1988:2-2000:2, with the current value of the BBI just missing the cut-off for the 10% significance level. However, if we include a dummy variable of ones for the 1996:2-1999:2 period to represent Greenspan’s new outlook on the level of non-inflationary growth in the economy, then the current value of the BBI becomes significant at the 5% level.

	<u>Dependent variable, 88:2-00:2</u>	<u>R<sup>2</sup> adj.</u>	<u>Std error</u>	<u>Explanatory variables</u>	<u>t-stat</u>
(9)	Change in the federal funds rate	.84	.18	Lagged level of the funds rate	-5.0
				4-qtr average % change in the GDP deflator	6.3
				Mfg capacity utilization	5.8
				Beige book index (BBI)	1.7
				BBI lagged one quarter	3.4
				Integrated BBI lagged two periods	3.2
(10)	Change in the federal funds rate	.84	.18	Lagged level of the funds rate	-2.0
				4-qtr average % change in the GDP deflator	3.0
				Mfg capacity utilization	4.4
				BBI	3.7
				BBI lagged one quarter	6.2
				Step dummy, 1996:2-99:2	-3.1

The lower standard error of regression 9 compared to 8 indicates that the format change has improved the fit, probably because of the better representation of the BBI’s dynamics. The typical business economist will likely be interested in the simplest version of this regression, however, so regression 10 removes the integrated BBI variable and includes the 1996:2-99:2 dummy. The large rise in t-values on the BBI terms indicates both the contribution of the dummy

term and the removal of multicollinearity between the BBI terms and the integrated BBI. If desired, the CPI core inflation rate (the CPI less food and energy) can be substituted for the GDP deflator with very little loss in fit.

To test the robustness of our results, other potential competitors to the BBI were added to regression 10, such as both the “as reported” and current versions of the percent changes in manufacturing production, real GDP, employment, retail sales, the coincident indicators, and the change in the unemployment rate. None proved to be significant, while the BBI terms and manufacturing capacity utilization retained their significance in all cases.

### **Conclusion**

Both manufacturing capacity utilization and an index created from the text of the Beige book reports proved to be helpful in explaining movements of the federal funds interest rate, the Federal Reserve’s main short-run operating target in conducting monetary policy. The Beige book index also proved to be correlated with other meaningful economic variables, useful as a broad-based tracker of the economy since it was helpful in predicting the revised coincident indicators index, and reasonably easy to construct while still maintaining internal consistency. Therefore, the BBI may be of interest to the macro-oriented business economist as a way of making the information contained in the Beige book more tractable.

### **References**

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## Appendix

A spreadsheet with a list of every district summary sentence and their scores may be obtained from the author upon request. The data for our Beige book index, by issue, are as follows:

Release date	Score	Release date	Score	Release date	Score	Release date	Score
06/29/83	9½	01/27/88	5¾	01/20/93	6.2	01/21/98	8½
08/10/83	9½	03/15/88	4½	03/10/93	3.0	03/18/98	6¼
09/20/83	6½	05/04/88	7.0	05/05/93	2.7	05/06/98	8¼
11/02/83	8.0	06/15/88	4.0	06/23/93	1.0	06/17/98	8.0
12/06/83	8½	08/02/88	3.0	08/04/93	2.3	08/05/98	3¼
01/20/84	11½	09/06/88	2.0	09/08/93	1.2	09/16/98	½
03/13/84	8½	10/18/88	2½	11/03/93	5.3	11/04/98	-2.0
05/08/84	3.0	11/30/88	1½	12/08/93	5.2	12/09/98	½
06/25/84	½	01/25/89	5¾	01/19/94	8.2	01/20/99	6¼
08/06/84	1.0	03/15/89	6½	03/09/94	5.8	03/17/99	8¼
09/16/84	-1.0	05/03/89	-2¼	05/04/94	9.3	05/05/98	9½
10/23/84	½	06/21/89	-2½	06/22/94	6.2	06/16/99	8.0
12/05/84	-1½	08/09/89	-6¾	08/03/94	6.8	08/12/99	6¾
01/30/85	5.0	09/20/89	1.0	09/14/94	2.5	09/22/99	6½
03/12/85	3½	11/01/89	0.0	11/02/94	6.8	11/03/99	4¾
05/06/85	2.0	12/06/89	-1½	12/07/94	7.0	12/08/99	8.0
06/25/85	-1.0	01/24/90	1.0	01/18/95	6.0	01/19/00	10½
08/06/85	-½	03/14/90	¾	03/15/95	¼	03/08/00	10½
09/16/85	-1¼	05/02/90	3¼	05/10/95	-1.0	05/03/00	9.0
10/23/85	3.0	06/20/90	-3¼	06/21/95	0.0	06/14/00	5.0
12/05/85	0.0	08/08/90	-1½	08/09/95	2.0	08/09/00	2¾
01/28/86	4.0	09/19/90	-5.0	09/13/95	1¾		
03/20/86	7.0	10/31/90	-6½	11/01/95	2¼		
05/06/86	6.0	12/05/90	-8½	12/06/95	2.0		
06/24/86	1.0	01/23/91	-8½	01/17/96	-2.0		
08/05/86	0.0	03/13/91	-5¼	03/13/96	3.0		
09/10/86	-1.0	05/01/91	-1½	05/08/96	6½		
10/23/86	3½	06/19/91	3.0	06/19/96	9.0		
12/01/86	3½	08/07/91	0.0	08/07/96	6.0		
01/28/87	4.0	09/18/91	-1¼	09/11/96	5½		
03/16/87	5.0	10/23/91	-2½	10/30/96	5¼		
05/04/87	5.0	12/04/91	-7.0	12/04/96	5.0		
06/23/87	2½	01/22/92	-6½	01/22/97	6¾		
08/03/87	4¾	03/18/92	2½	03/12/97	7.0		
09/08/87	4½	05/06/92	5.0	05/07/97	6½		
10/21/87	5½	06/17/92	1.7	06/18/97	4.0		
12/01/87	4½	08/05/92	-2¼	08/06/97	7¾		
		09/23/92	0.3	09/17/97	8.0		
		11/04/92	-0.2	10/29/97	5¼		
		12/09/92	4.2	12/03/97	6.0		