The Spatial Model of Voting: Theory and Empirics

*CSLS Empirical Methods Workshop*

November 16, 2012

Kevin M. Quinn
UC Berkeley
Overview

- very basic introduction to theoretical ideas behind spatial models of voting
Overview

- very basic introduction to theoretical ideas behind spatial models of voting
- very basic introduction to attempts to estimate parameters of spatial models
Overview

- very basic introduction to theoretical ideas behind spatial models of voting
- very basic introduction to attempts to estimate parameters of spatial models
- exposure to some results from some work in this area (no claim of representativeness)
Background

The key ingredients:
Background

The key ingredients:

- policy space
Background

The key ingredients:

- policy space
- actors
Background

The key ingredients:

- policy space
- actors
- preferences
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- policy space
- actors
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- behavioral assumptions (sincere vs. strategic behavior)
Background

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- preferences
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- institutions (rules of the game)
Background

The key ingredients:

- policy space
- actors
- preferences
- behavioral assumptions (sincere vs. strategic behavior)
- institutions (rules of the game)
- information (important but we will ignore this today)
The Spatial Model of Voting: Theory and Empirics

Background

Example: Candidate Competition
The Median Voter Theorem
Example: Statutory Interpretation

Empirics
The Spatial Model as an Empirical Model
Example: The US Congress
Example: The US Supreme Court
Example: Newspaper Editorial Boards
Misconceptions

Utility of Status Quo
Utility of Alternative
Utility Function
The Spatial Model of Voting: Theory and Empirics

Background

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Misconceptions

Additional examples on board.
Candidate Competition

In class example
The Spatial Model of Voting: Theory and Empirics

The Median Voter Theorem

Assume an odd number of voters and a uni-dimensional policy space.
The Median Voter Theorem

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Voters have single-peaked preferences.
The Median Voter Theorem

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Voters have single-peaked preferences.

The policy position corresponding to the median voter’s ideal point is a stable outcome in that it defeats all alternatives in a binary majority rule vote.
The Median Voter Theorem

Assume an odd number of voters and a uni-dimensional policy space.

Voters have single-peaked preferences.

The policy position corresponding to the median voter’s ideal point is a stable outcome in that it defeats all alternatives in a binary majority rule vote.

NB: The uni-dimensional policy space is very important for this result.
Statutory Interpretation

Statutory Interpretation

Three interpretative stances a court might take:

1. **Naive textualist.** A naive textualist (NT) interprets the legislation as close as possible to that as desired by the enacting legislature. We call this “naive” because such a court does not take into account the political consequences of its decisions, i.e., whether its interpretations are politically viable.

2. **Politically sophisticated honest agent.** A politically sophisticated honest agent of the enacting legislature (SA) decides a case so as to gain a policy outcome as close as possible to that desired by the enacting legislature. Sophisticated agents take into account current political circumstances and hence whether their interpretations are politically viable.

3. **Unconstrained policy advocate.** An unconstrained policy advocate (UPA) is a court with well-defined preferences over policy that attempts to impose its own preferences. We assume that an unconstrained court is politically sophisticated (as opposed to naive) and takes into account whether its interpretations are politically viable.
The Spatial Model of Voting: Theory and Empirics

Empirics

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The Spatial Model of Voting:

Theory and Empirics

The Spatial Theory of Voting

![Graph showing utility function, status quo, ideal point, and alternative options.]

- Utility of Status Quo
- Utility of Alternative
- Utility Function
- Latent Dimension
- Status Quo
- Ideal Point
- Alternative
The Spatial Model as an Empirical Model
Let \( i \) index votes and \( j \) index voters

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The Random utility of the status quo point for the voter \( j \):
\[
u(o)_{ij} = -|\theta_j - x(o)_i|^2 + \delta(o)_{ij}
\]

The Random utility of the alternative point for the voter \( j \):
\[
u(a)_{ij} = -|\theta_j - x(a)_i|^2 + \delta(a)_{ij}
\]

Utility difference:
\[
y^*_{ij} = u(o)_{ij} - u(a)_{ij} = \left[x(a)_i - x(o)_i\right] \theta_j + \left[\delta(o)_{ij} - \delta(a)_{ij}\right]
\]

\[\epsilon_{ij} \sim N(0,1)\]

If \( y_{ij} = 1 \) is a vote for the status quo:
\[
\Pr(y_{ij} = 1 | \alpha_i, \beta_i, \theta_j) = \Pr(y^*_{ij} > 0 | \alpha_i, \beta_i, \theta_j) = \Phi(\alpha_i + \beta_i \theta_j)
\]
The Spatial Model as an Empirical Model

Let $i$ index votes and $j$ index voters

$x_i^{(o)}$: status quo point
$x_i^{(a)}$: alternative point
$\theta_j$: $j$’s most preferred policy
The Spatial Model as an Empirical Model

Let \( i \) index votes and \( j \) index voters

\[ x_i^{(o)}: \text{status quo point} \]
\[ x_i^{(a)}: \text{alternative point} \]
\[ \theta_j: j\text{'s most preferred policy} \]

Random utility of \( x_i^{(o)} \) for \( j \): \( u_{ij}^{(o)} = -|\theta_j - x_i^{(o)}|^2 + \delta_{ij}^{(o)} \)
The Spatial Model as an Empirical Model

Let \( i \) index votes and \( j \) index voters

\[ x_i^{(o)}: \text{status quo point} \]
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\[ u_{ij}^{(a)} = -|\theta_j - x_i^{(a)}|^2 + \delta_{ij}^{(a)} \]

Utility difference:
\[ y_{ij}^* = u_{ij}^{(o)} - u_{ij}^{(a)} \]
\[ = [x_i^{(a)} x_i^{(a)} - x_i^{(o)} x_i^{(o)}] + 2[x_i^{(o)} - x_i^{(a)}] \theta_j + [\delta_{ij}^{(o)} - \delta_{ij}^{(a)}] \]
\[ = \alpha_i + \beta_i \theta_j + \epsilon_{ij} \]

with \( \epsilon_{ij} \sim \mathcal{N}(0, 1) \)
The Spatial Model as an Empirical Model

Let *i* index votes and *j* index voters.

\( x_i^{(o)} \): status quo point

\( x_i^{(a)} \): alternative point

\( \theta_j \): *j*'s most preferred policy

Random utility of \( x_i^{(o)} \) for *j*: 

\[
U_{ij}^{(o)} = -|\theta_j - x_i^{(o)}|^2 + \delta_{ij}^{(o)}
\]

Random utility of \( x_i^{(a)} \) for *j*: 

\[
U_{ij}^{(a)} = -|\theta_j - x_i^{(a)}|^2 + \delta_{ij}^{(a)}
\]

Utility difference:

\[
y_{ij}^* = U_{ij}^{(o)} - U_{ij}^{(a)}
= [x_i^{(a)}x_i^{(a)} - x_i^{(o)}x_i^{(o)}] + 2[x_i^{(o)} - x_i^{(a)}]\theta_j + [\delta_{ij}^{(o)} - \delta_{ij}^{(a)}]
= \alpha_i + \beta_i\theta_j + \epsilon_{ij}
\]

with \( \epsilon_{ij} \sim \mathcal{N}(0, 1) \)

If \( y_{ij} = 1 \) is a vote for the status quo:

\[
\Pr(y_{ij} = 1|\alpha_i, \beta_i, \theta_j) = \Pr(y_{ij}^* > 0|\alpha_i, \beta_i, \theta_j) = \Phi(\alpha_i + \beta_i\theta_j)
\]
The Spatial Model as an Empirical Model

The likelihood function is proportional to:

\[
p(y|\alpha, \beta, \theta) = \prod_{i=1}^{n} \prod_{j=1}^{m} \Phi(\alpha_i + \beta_i \theta_j)^{y_{ij}} [1 - \Phi(\alpha_i + \beta_i \theta_j)]^{1-y_{ij}}
\]
The Spatial Model as an Empirical Model

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p(y|\alpha, \beta, \theta) = \prod_{i=1}^{n} \prod_{j=1}^{m} \Phi(\alpha_i + \beta_i \theta_j)^{y_{ij}} [1 - \Phi(\alpha_i + \beta_i \theta_j)]^{1-y_{ij}}
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Identification issues
The Spatial Model of Voting: Theory and Empirics

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The Spatial Model as an Empirical Model

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Identification issues

Coding of \( y \)
The Spatial Model as an Empirical Model

Cutpoints / Cutlines:

The point of indifference between the status quo and alternative is the point where the probability of choosing either one is 0.5 or equivalently where \( \alpha_i + \beta_i \theta^* = 0 \).
The Spatial Model of Voting: Theory and Empirics

The Spatial Model as an Empirical Model

Cutpoints / Cutlines:

The point of indifference between the status quo and alternative is the point where the probability of choosing either one is 0.5 or equivalently where \( \alpha_i + \beta_i \theta^* = 0 \).

Elementary algebra reveals that the cutpoint for vote \( i \) is

\[
\theta^* = -\frac{\alpha_i}{\beta_i}
\]
The Spatial Model as an Empirical Model

Interpretation

$\alpha_i$: related to baseline propensity to see a $y = 1$ on vote $i$

$\beta_i$: sign determines whether $y = 1$ is a “left” or “right” vote, absolute value related to strength of association between latent $\theta$ and observed votes on $i$

$\theta_j$: latent ideal point for voter $j$
The Spatial Model as an Empirical Model

Interpretation

\( \alpha_i \): related to baseline propensity to see a \( y = 1 \) on vote \( i \)

\( \beta_j \): sign determines whether \( y = 1 \) is a “left” or “right” vote, absolute value related to strength of association between latent \( \theta \) and observed votes on \( i \)

\( \theta_j \): latent ideal point for voter \( j \)
The Spatial Model as an Empirical Model

Blakely v. Washington

Slope = 0

Gratz v. Bollinger

Slope > 0

Grutter v. Bollinger

Slope < 0
The Spatial Model as an Empirical Model

Blakely v. Washington

Gratz v. Bollinger

Grutter v. Bollinger

Majority (1)

Minority (0)

Slope = 0

Slope > 0

Slope < 0

Latent Dimension

Relationship to IRT models for standardized tests
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- Misconceptions

The US Congress

How might this work?
The Spatial Model of Voting: Theory and Empirics

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The US Congress

Figure 1
Point Estimates and 95% Confidence Intervals using 62 National Journal Key Votes
The Spatial Model of Voting: Theory and Empirics

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The US Congress

Figure 2
Rank Ordering and 95% Confidence Intervals using 62 National Journal Key Votes
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The US Congress

Figure 4
Rank Ordering and 95% Confidence Intervals including President Bust using all non-unanimous roll calls from the 107th Senate.

National Journal Key Votes

The US Congress

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The US Congress

The US Congress

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Unidimensional Summary

Thomas
Scalia
Rehnquist
Kennedy
O'Connor
Breyer
Souter
Ginsburg
Stevens

Single Dimension

Cutlines
n=495
5–4 split

The US Supreme Court
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The US Supreme Court Voting Over Time

Supreme Court Voting Over Time

McReynolds   Butler   Sutherland  Van Devanter  Sanford  Taft  McKenna  Stone  Holmes  Brandeis  Cardozo  Murphy  Rutledge  Black  Douglas  Blackmun  Burger  O'Connor  Kennedy  Powell  Rehnquist  Thomas  Scalia  Roberts  Alito

Latent Dimension

Pre-New Deal Lochner Court  New Deal Court

Term

1920 1940 1960 1980 2000
### The Spatial Model of Voting: Theory and Empirics

#### Theory Background
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**Agreements Among Supreme Court Justices in Controversial Cases, 1939 and 1940 Terms**

*In Percentages*

<table>
<thead>
<tr>
<th>Justice</th>
<th>McReynolds</th>
<th>Roberts</th>
<th>Hughes</th>
<th>Stone</th>
<th>Reed</th>
<th>Frankfurter</th>
<th>Murphy</th>
<th>Black</th>
<th>Douglas</th>
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</thead>
<tbody>
<tr>
<td>McReynolds</td>
<td>—</td>
<td>64</td>
<td>64</td>
<td>41</td>
<td>35</td>
<td>31</td>
<td>38</td>
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<td>24</td>
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<tr>
<td>Roberts</td>
<td>64</td>
<td>—</td>
<td>75</td>
<td>51</td>
<td>45</td>
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<tr>
<td>Hughes</td>
<td>64</td>
<td>75</td>
<td>—</td>
<td>78</td>
<td>63</td>
<td>64</td>
<td>53</td>
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<tr>
<td>Stone</td>
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<td>81</td>
<td>84</td>
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<td>69</td>
<td>68</td>
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<tr>
<td>Reed</td>
<td>35</td>
<td>45</td>
<td>63</td>
<td>81</td>
<td>—</td>
<td>86</td>
<td>80</td>
<td>79</td>
<td>79</td>
</tr>
<tr>
<td>Frankfurter</td>
<td>31</td>
<td>45</td>
<td>64</td>
<td>84</td>
<td>86</td>
<td>—</td>
<td>91</td>
<td>85</td>
<td>84</td>
</tr>
<tr>
<td>Murphy</td>
<td>38</td>
<td>39</td>
<td>53</td>
<td>75</td>
<td>80</td>
<td>91</td>
<td>—</td>
<td>89</td>
<td>89</td>
</tr>
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<td>Black</td>
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<td>49</td>
<td>69</td>
<td>79</td>
<td>85</td>
<td>89</td>
<td>—</td>
<td>100</td>
</tr>
<tr>
<td>Douglas</td>
<td>24</td>
<td>36</td>
<td>49</td>
<td>68</td>
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<td>—</td>
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- Misconceptions

The US Supreme Court

How might we measure the political positions of newspaper editorial boards?
Newspaper Editorial Boards

Political Positions of Newspapers

- 495 Supreme Court cases from 1994-2004 terms
- 25 major newspapers
- 1500 editorial-case positions
- We personally read and checked the coding for each of the 1500 editorial positions
  1: clearly in favor of majority position
  0: clearly against majority position
  ?: unclear but covered
- This simple coding allows a simple item response theory model to be used to compare the newspapers and justices to each other.

More detail in:

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### Newspaper Editorial Boards

<table>
<thead>
<tr>
<th>Newspaper</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington Times</td>
<td>WT</td>
</tr>
<tr>
<td>Atlanta Journal</td>
<td>AJ</td>
</tr>
<tr>
<td>Investor's Business Daily</td>
<td>INV</td>
</tr>
<tr>
<td>Atlanta Constitution</td>
<td>AC</td>
</tr>
<tr>
<td>Rocky Mountain News</td>
<td>RMN</td>
</tr>
<tr>
<td>Miami Herald</td>
<td>MH</td>
</tr>
<tr>
<td>San Diego Union Tribune</td>
<td>SDUT</td>
</tr>
<tr>
<td>Minneapolis Star Tribune</td>
<td>MST</td>
</tr>
<tr>
<td>Cleveland Plain Dealer</td>
<td>CPD</td>
</tr>
<tr>
<td>Detroit Free Press</td>
<td>DFP</td>
</tr>
<tr>
<td>Atlanta Journal Constitution</td>
<td>A JC</td>
</tr>
<tr>
<td>Philadelphia Inquirer</td>
<td>PI</td>
</tr>
<tr>
<td>Arizona Republic</td>
<td>AR</td>
</tr>
<tr>
<td>Boston Globe</td>
<td>BG</td>
</tr>
<tr>
<td>Chicago Sun–Times</td>
<td>CST</td>
</tr>
<tr>
<td>Dallas Morning News</td>
<td>DMN</td>
</tr>
<tr>
<td>San Francisco Chronicle</td>
<td>SFC</td>
</tr>
<tr>
<td>Houston Chronicle</td>
<td>HC</td>
</tr>
<tr>
<td>New York Post</td>
<td>NYP</td>
</tr>
<tr>
<td>Chicago Tribune</td>
<td>CT</td>
</tr>
<tr>
<td>Washington Post</td>
<td>WP</td>
</tr>
<tr>
<td>Los Angeles Times</td>
<td>LAT</td>
</tr>
<tr>
<td>New York Times</td>
<td>LAT</td>
</tr>
<tr>
<td>Wall Street Journal</td>
<td>WSJ</td>
</tr>
<tr>
<td>USA Today</td>
<td>USA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Circulation (1000s)</th>
<th>500</th>
<th>1000</th>
<th>1500</th>
<th>2000</th>
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</thead>
<tbody>
<tr>
<td>Editorials</td>
<td>20</td>
<td>40</td>
<td>60</td>
<td>80</td>
</tr>
</tbody>
</table>
Newspaper Editorial Boards

The court reached one of its lowest moments of the term when it ruled in favor of the Boy Scouts’ right to exclude gay members. The four dissenters – Justices Stevens, Ginsburg, Breyer and Souter – did not challenge the principle that an organization cannot be forced to adopt an unwanted message. But the dissenters correctly noted that the Boy Scouts had failed to show that admitting gays was fundamentally incompatible with the organization’s core mission, the test the court has traditionally applied to groups trying to escape an anti-discrimination law.

James Dale, the excluded Eagle Scout, deserved better. So did the rest of the nation.
THE QUESTION of whether the Boy Scouts can discriminate against gays pits core values of free association against important anti-discrimination principles: legally, a tough call. We thought that the scouts, especially given their unusual quasi-public status, could lawfully be stopped from excluding gays. A sharply divided Supreme Court yesterday disagreed, holding that the scouts’ First Amendment rights trump a New Jersey anti-discrimination law that forbids discrimination on the basis of sexual orientation. The opinion is more a comment on the First Amendment’s broad scope than a validation of prejudice. The Boy Scouts’ discrimination against gays remains as offensive and wrong a position following the court’s decision as it was before.
Newspaper Editorial Boards

In another important case in which the justices arrived at the proper decision, the court declared that the Boy Scouts of America have a right to exclude homosexuals as leaders. By a narrow 5-4 margin, the court ruled that private, nonprofit organizations, like the scouts, have a First Amendment right to "free association." As such, they may not be forced to accept members or leaders whose views or comportment are contrary to that for which the private organization stands.

Critics of the court’s decision argue that the justices have given groups, like the scouts, a license to discriminate. But had the court come down the other way, then a group like the NAACP could be forced to accept, say, a Ku Klux Klan member; and the B’nai B’rith could be forced to accept a neo-Nazi in its midst.
Today, lawyers have become the pre-eminent befuddlers of common sense. Among the dangerous nonsense purveyed by these folks is the recent attempt to compel the Boy Scouts of America - a traditionalist youth group whose mission is to help make young men "morally straight" - to accept a homosexual scoutmaster and avowed gay rights activist. All this, on "anti-discrimination" grounds.

Wednesday, the Supreme Court rejected the idea, which had been upheld by the New Jersey Supreme Court, that the Boy Scouts had no fundamental right to exclude would-be members who do not subscribe to or conform with the organization's most basic tenets. In this particular instance, the Boy Scouts withdrew the membership of former Assistant Scoutmaster James Dale, an adult volunteer, after learning of his homosexual lifestyle. This, of course, put the Boy Scouts in the gunsights as one of the last remaining bastions of American culture that has not bowed to the gay agenda - which demands not merely live-and-let live tolerance, but total acceptance - indeed, emphatic endorsement.
Newspaper Editorial Boards

Ideal Point Estimates

Newspaper Ranks

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Probability
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Misconceptions
Misconceptions

Some scholars have expressed concern about the use of ideal point models to study judicial behavior.

In some cases, this seems to be a knee jerk reaction against quantification of judicial behavior.

In other cases, more sophisticated concerns are raised about the data coding, modeling assumptions, and properties of the estimates.

Most of the following examples are from Ho and Quinn. 2010. “How Not to Lie with Judicial Votes: Misconceptions, Measurement, and Models.” California Law Review.
Every Case Is Counted Equally

- **Blakely v. Washington**: Slope \(\approx 0\)

- **Gratz v. Bollinger**: Slope > 0

- **Grutter v. Bollinger**: Slope < 0

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**Theory**
- Background
- Example: Candidate Competition
- The Median Voter Theorem

**Empirics**
- The Spatial Model as an Empirical Model
- Example: The US Congress
- Example: The US Supreme Court
- Example: Newspaper Editorial Boards

**Misconceptions**
- Every Case Is Counted Equally
Every Case Is Counted Equally
Unidimensional Models are Useless in a Multidimensional World

The idea that something as complicated as Supreme Court decisionmaking can be captured with a uni-dimensional spatial model is very counterintuitive (outrageous???) to many scholars of the court.
Unidimensional Models are Useless in a Multidimensional World
Unidimensional Models are Useless in a Multidimensional World

Comparison of ability to classify votes on cases with Westlaw Key Number *Statutory Construction and Operation (361VI)* relative to null distribution formed from all nonunanimous cases in term.
Selection Bias Creates Serious Problems
All Estimates from Latent Variable Models Are Sensitive to Arbitrary Modeling Assumptions
The Spatial Model of Voting: Theory and Empirics

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Misconceptions

All Estimates from Latent Variable Models Are Sensitive to Arbitrary Modeling Assumptions

<table>
<thead>
<tr>
<th>Term</th>
<th>Justice</th>
<th>Prob. Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>Kennedy</td>
<td>0.574</td>
</tr>
<tr>
<td>1999</td>
<td>O’Connor</td>
<td>0.901</td>
</tr>
<tr>
<td>2000</td>
<td>O’Connor</td>
<td>0.992</td>
</tr>
<tr>
<td>2001</td>
<td>O’Connor</td>
<td>&gt; 0.999</td>
</tr>
<tr>
<td>2002</td>
<td>O’Connor</td>
<td>0.998</td>
</tr>
</tbody>
</table>

(from Martin, Quinn, & Epstein, 2005)

These are useful summaries under a very wide range of assumptions.