Suspense-optimal college football playoffs

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Motivation

College football has historically not had a postseason playoff tournament.

Pre-1998: champion determined by polls (AP and others)
Post-1998: championship game determined by polls (BCS)

In 2012, colleges finally agreed to start playoff, but with just 4 teams.

Still talk of playoff expansion, controversial, seems fans support (Gallup, Quinnipiac polls).
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Subtle cost of playoff expansion: reduces significance of regular season games

- When just 2 teams make the playoffs, each regular season game is crucial.
- If all teams make playoffs, each regular season game would be meaningless.
- More playoff teams, less impact to regular season games.
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- By this logic - college football regular season more important than that of other sports

- TV viewership data supports this claim
  - In 2012 regular season, 16.2 million watched Alabama-Georgia
  - 16.1 million watched Notre Dame-USC
  - 26 million watched championship game

- College basketball 2012: 4.1 million watched UNC-Duke in regular season
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- Pro football 2012: 30 million max in regular season
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Broader question: why do people get utility from watching sports?

▶ I.e. utility from obtaining information, anticipating information
▶ Why we read mystery novels, gamble slowly at casinos instead of all at once, follow politics
▶ Utility from watching sports in part from suspense, surprise of games
▶ This paper: quantify the loss in regular season EFK suspense, gain in postseason suspense, from adding playoff teams
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EFK’s model

There is unknown state of the world, finite state space

The belief (probability) of state \( \omega \) in period \( t \) is \( \mu_{\omega t} \)

Next period’s belief is a random variable, \( \sim \mu_{\omega t+1} \), with \( E_t[\sim \mu_{\omega t+1}] = \mu_{\omega t} \) (martingale belief path)

EFK define utility from suspense in period \( t \) as \( u(E_t \sum_{\omega} (\sim \mu_{\omega t+1} - \mu_{\omega t})^2) \)

(Utility of the aggregated variance in beliefs that will change in that period)

Utility from surprise is \( u(\sum_{\omega} (\mu_{\omega t} - \mu_{\omega t-1})^2) \)

(A function of how much beliefs actually change)

We follow their use of \( u(x) = x^{0.5} \) as baseline case

We call this definition baseline suspense
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Intuition

Suspense is the enjoyable tension from knowing something significant is about to happen that could answer some important question.

Surprise is the utility obtained from learning something new.

There is sometimes a tradeoff (suspense means expecting a surprise... but the biggest surprises come when unexpected).

But in general, belief paths that "generate more suspense also tend to generate more surprise".

That is, suspense ≈ E(surprise)
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3. We find results are very similar for alternative version of suspense that exactly equals $E(\text{surprise})$: 

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Example

Think of No. 1 team playing No. 25 team in week 1

Suppose No. 1 has 10% chance of losing

If No. 1 loses, it has 5% chance of finishing regular season in top 2; ex ante chance of 40% and ex post is same if wins

And has 50% chance of winning championship game

Then linear suspense is: 0.1 \times |0.5(0.4 - 0.05)| = 0.0175

If No. 1 loses, it has 50% chance of finishing regular season in top 16; ex ante chance of 75% and ex post is same if wins

And has 25% chance of winning championship in 16 team playoff

Then linear suspense is: 0.1 \times |0.25(0.75 - 0.5)| = 0.00625

With 16 team playoff, less suspense, because loss is much less significant
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Empirical Method

Goal: to estimate suspense over course of season (regular and playoff) for different playoff formats (2-16 teams)

Need: distributions of each team being champ in each week, and distribution of changes week to week

Could condition on personnel, records, schedule etc..

Simplify by just conditioning on (AP) ranks, which incorporate all these factors

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- E.g., we estimate chance that 1-4 seed beats 5-8 seed in playoff game as chance that No. 1-4 team beat No. 5-8 team in bowl game
Data

Data requirements are ranks for all weeks of historical seasons and bowl game results.

Sample sizes for bowl results pretty small, even with aggregation.

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<th>Rank Matchup</th>
<th>Pr(Higher rank wins)</th>
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Table: Summary statistics, bowl game results for games between teams ranked No. 1-16

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<td>4</td>
<td>2.293</td>
<td>1.163</td>
</tr>
<tr>
<td>8</td>
<td>1.492</td>
<td>1.544</td>
</tr>
<tr>
<td>16</td>
<td>0.961</td>
<td>1.808</td>
</tr>
</tbody>
</table>
### Results

#### Table: Baseline suspense and linear suspense

<table>
<thead>
<tr>
<th></th>
<th>Number of playoff teams</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td><strong>Baseline Suspense</strong></td>
<td>Regular season</td>
<td>3.112</td>
<td>2.293</td>
<td>1.492</td>
<td>0.961</td>
</tr>
<tr>
<td></td>
<td>Playoffs</td>
<td>0.700</td>
<td>1.163</td>
<td>1.544</td>
<td>1.808</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>3.811</strong></td>
<td><strong>3.456</strong></td>
<td><strong>3.036</strong></td>
<td><strong>2.769</strong></td>
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<tr>
<td><strong>Linear Suspense</strong></td>
<td>Regular season</td>
<td>7.274</td>
<td>6.094</td>
<td>4.791</td>
<td>3.415</td>
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<tr>
<td></td>
<td>Playoffs</td>
<td>0.980</td>
<td>1.820</td>
<td>2.799</td>
<td>3.730</td>
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<tr>
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<td><strong>Total</strong></td>
<td><strong>8.254</strong></td>
<td><strong>7.914</strong></td>
<td><strong>7.591</strong></td>
<td><strong>7.145</strong></td>
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### Robustness

<table>
<thead>
<tr>
<th>Number of playoff teams</th>
<th>Pr(higher playoff seed wins)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Regular season 3.114</td>
</tr>
<tr>
<td></td>
<td>Playoffs 0.707</td>
</tr>
<tr>
<td></td>
<td>Total (suspense) 3.821</td>
</tr>
<tr>
<td>2</td>
<td>3.260</td>
</tr>
<tr>
<td></td>
<td>0.648</td>
</tr>
<tr>
<td></td>
<td>3.908</td>
</tr>
<tr>
<td>4</td>
<td>2.103</td>
</tr>
<tr>
<td></td>
<td>1.142</td>
</tr>
<tr>
<td></td>
<td>3.539</td>
</tr>
<tr>
<td>8</td>
<td>1.308</td>
</tr>
<tr>
<td></td>
<td>1.518</td>
</tr>
<tr>
<td></td>
<td>3.231</td>
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<tr>
<td>16</td>
<td>0.747</td>
</tr>
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<td></td>
<td>1.804</td>
</tr>
<tr>
<td></td>
<td>3.018</td>
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</table>
### Robustness

**Table:** Robustness checks: playoff game result distributions

<table>
<thead>
<tr>
<th>Pr(higher playoff seed wins)</th>
<th>Regular season</th>
<th>Playoffs</th>
<th>Total (suspense)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pr(higher playoff seed wins) = 0.5</td>
<td>3.114</td>
<td>2.103</td>
<td>1.308</td>
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<tr>
<td></td>
<td>0.707</td>
<td>1.207</td>
<td>1.561</td>
</tr>
<tr>
<td><strong>Total (suspense)</strong></td>
<td><strong>3.821</strong></td>
<td><strong>3.310</strong></td>
<td><strong>2.868</strong></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Pr(higher playoff seed wins) = 0.7</th>
<th>Regular season</th>
<th>Playoffs</th>
<th>Total (suspense)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.260</td>
<td>2.397</td>
<td>1.714</td>
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<tr>
<td></td>
<td>0.648</td>
<td>1.142</td>
<td>1.518</td>
</tr>
<tr>
<td><strong>Total (suspense)</strong></td>
<td><strong>3.908</strong></td>
<td><strong>3.539</strong></td>
<td><strong>3.231</strong></td>
</tr>
</tbody>
</table>
### Robustness checks: recent season subsamples

<table>
<thead>
<tr>
<th>Number of playoff teams</th>
<th>2</th>
<th>4</th>
<th>8</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular season 1998-2011</td>
<td>3.391</td>
<td>2.525</td>
<td>1.663</td>
<td>1.075</td>
</tr>
<tr>
<td>Playoffs 1998-2011</td>
<td>0.700</td>
<td>1.163</td>
<td>1.544</td>
<td>1.808</td>
</tr>
<tr>
<td>Total (suspense) 1998-2011</td>
<td>4.091</td>
<td>3.688</td>
<td>3.207</td>
<td>2.883</td>
</tr>
<tr>
<td>Regular season 2005-2011</td>
<td>4.079</td>
<td>2.972</td>
<td>1.956</td>
<td>1.293</td>
</tr>
<tr>
<td>Playoffs 2005-2011</td>
<td>0.700</td>
<td>1.163</td>
<td>1.544</td>
<td>1.808</td>
</tr>
<tr>
<td>Total (suspense) 2005-2011</td>
<td>4.779</td>
<td>4.135</td>
<td>3.500</td>
<td>3.101</td>
</tr>
</tbody>
</table>

Notes: All values are baseline suspense. Playoff (bowl game) distributions from original sample (1990-2011).
## Robustness 2

### Table: Robustness checks: recent season subsamples

<table>
<thead>
<tr>
<th>Sample</th>
<th>Number of playoff teams</th>
<th>2</th>
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<tbody>
<tr>
<td>Regular season</td>
<td>1998-2011 sample</td>
<td>3.391</td>
<td>2.525</td>
<td>1.663</td>
<td>1.075</td>
</tr>
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<td></td>
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</tr>
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</table>

Notes: All values are baseline suspense. Playoff (bowl game) distributions from original sample (1990-2011).
Discussion

As expected: more playoff teams increases playoff suspense, decreases regular season suspense.

Data shows the decline in regular season suspense is consistently the dominant effect.

Why?
Discussion

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- Data shows the decline in regular season suspense is consistently the dominant effect
Discussion

- As expected: more playoff teams increases playoff suspense, decreases regular season suspense
- Data shows the decline in regular season suspense is consistently the dominant effect
- Why?
Regular season weekly linear suspense, top 6 teams
Figure: Linear suspense, by rank, for top six ranks in each week of regular season, for different playoff formats.
Weekly championship probabilities, No. 1 and No. 4 teams
Weekly championship probabilities, No. 1 and No. 4 teams

Figure: Estimated probability of being champion for No. 1 and No. 4 ranked teams at start of each week of regular season, for playoff formats with two and 16 teams.
Discussion

There is substantial uncertainty early in the season about eventual champ and it is steadily resolved throughout the season. Since the regular season is longer than the playoffs (even with 16 teams), and each week is suspenseful, regular season suspense dominates.

Non-trivial - eg, if the preseason top 2 teams are very likely to play in the championship game, then there would be low regular season suspense for any playoff format. Or even if not, if the top teams rarely moved around early in the season, then there would be little suspense in early season. Or even if not, if the regular season were so long that the top 2 teams clearly emerged, there would be little suspense.

College football regular season is perhaps “just right” to make a 2 team playoff suspense-optimal.
Discussion

- There is substantial uncertainty early in the season about eventual champ.
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- And it is steadily resolved throughout the season
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Illustrative Analysis of TV Viewership
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- Also - rough estimates of viewership elasticity of suspense

Viewership data drawn from NFL, NBA and NCAA (basketball and football), reg season and playoffs

Numbers drawn from Nielsen state of media reports (public)

Suspense calculations made with simplified assumptions

Regress viewership on suspense and controls (sports, pro/college, holiday)
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We estimate a suspense elasticity of viewership of around 0.3
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- This is *not* high enough to make 2 team season-long viewership > 16 team playoff
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- This is *not* high enough to make 2 team season-long viewership > 16 team playoff

Table: OLS results: estimated effects of suspense on TV viewership, millions (N=70)

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
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<tbody>
<tr>
<td>Baseline Suspense</td>
<td>42.389***</td>
<td>–</td>
<td><strong>0.299</strong></td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>(3.615)</td>
<td></td>
<td>(0.022)</td>
<td></td>
</tr>
<tr>
<td>Linear Suspense</td>
<td>–</td>
<td>30.049***</td>
<td>–</td>
<td><strong>0.280</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.561)</td>
<td></td>
<td>(0.021)</td>
</tr>
<tr>
<td>Basketball</td>
<td>4.005</td>
<td>-5.115*</td>
<td>-1.079***</td>
<td>-1.155***</td>
</tr>
<tr>
<td></td>
<td>(2.955)</td>
<td>(2.945)</td>
<td>(0.324)</td>
<td>(0.327)</td>
</tr>
<tr>
<td>Pro</td>
<td>13.038***</td>
<td>11.942***</td>
<td>1.457***</td>
<td>1.405***</td>
</tr>
<tr>
<td></td>
<td>(3.047)</td>
<td>(3.037)</td>
<td>(0.339)</td>
<td>(0.341)</td>
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<tr>
<td>Pro basketball</td>
<td>-11.990***</td>
<td>-10.893***</td>
<td>-0.982***</td>
<td>-0.906**</td>
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<td>(3.182)</td>
<td>(3.166)</td>
<td>(0.350)</td>
<td>(0.352)</td>
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<td>Log-log</td>
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<td>✓</td>
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Discussion

Two-team playoff (e.g. BCS system, i.e. no playoff!) is suspense-optimal. Helps explain popularity of sport despite lack of playoff. Other reasons to favor bowl system: fans of many teams win a smaller, psychological championship; travel is easier to plan in advance to attend games; historical tradition favoring the bowls. Longer season with more playoff games imposes additional burden on athletes. But, suspense-optimal \( \neq \) optimal. Viewership results suggest that more factors play into fan utility than just suspense. (May help explain longer seasons and larger playoff formats in professional sports). Finally, a larger playoff format may be perceived as more fair.
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- Two-team playoff (e.g. BCS system, i.e. no playoff!) is suspense-optimal
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