JDEP 384H: Numerical Methods in Business

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Outline

Preliminaries

1. Open up the pdf file ProbStatLecture-384H.pdf and fire up Matlab. Get help on `addpath` and use it to put your m files in Matlab's path.

Credit and Thanks: The m files we're using today are found on the outstanding site of James P. LeSage at `http://www.spatial-econometrics.com/`

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Discrete Example

After viewing the probability discussion in ProbStatLecture:

Dart board experiment:

The dart board consists of six regions of equal area, and dart is thrown without bias to any region.

Answer these questions:

1. What is the probability of landing in any one region?
2. Suppose the experiment is repeated once. What is the probability of the event of both darts landing in the same region?

Simulating an Experiment

Let's simulate the dart experiment and graph the results of our experiments using Matlab. Type in

```
> N=36
> x = rand(N,1)*6;
> hist(x,0.5:5.5)
```

Now repeat with larger N.

Outline

Uniform Distribution

After viewing the statistics discussion through expectation and variance in ProbStatLecture:

Uniform distribution:

Let's take the case of $[a, b] = [0, 1]$.

Answer these questions:

1. What does the graph of the p.d.f. look like?
2. How does simple calculus help us find the c.d.f.?
3. Can we calulate the expectation and variance of the distribution, exactly and also with Matlab?
4. Can we verify a simple property of expectation and variance from definition?

Normality and Central Limit Theorem

Normal distributions:

Let's focus on the standard normal distribution

$$f(x) = \frac{1}{\sqrt{2\pi}} e^{-x^2/2}, \quad -\infty < x < \infty$$

After viewing discussion of normal distributions and the Central Limit Theorem, use addpath to point to the distribution files. Then

```
> x = -10:.1:10;
> help norm_cdf
> y = norm_cdf(x,0,1);
> plot(x,y)
> hold on
> help norm_pdf
> y = norm_pdf(x,0,1);
> plot(x,y)
```

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Common Distributions

After viewing the discussion of common distributions in ProbStatLecture:

1. Do a simple plot of the normal distributions $N(0, \sigma)$, $\sigma = 0.5, 1.0, 2.0, 3.0$.
2. Confirm the approximation assertion about Poisson vs binomial by calculating certain values or plotting (homework).
3. Get an idea of the shapes of non-normal distributions as one of their parameters vary.
4. Confirm the limiting assertion about the Student's t distribution (homework).