Matching Supply with Demand: The Newsvendor Model

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The Ford model T: Standardization

“Any customer can have a car painted any color that he wants so long as it is black”

Henry Ford (1909)

100 years ago business used to be an individual sport:
One product, produced by one company locally.
Had a very long life cycle (~15 years).
Today, business is a global team sport: iPhone is made by a lot of different companies globally. Has to be changed every year and sold globally.
Ecosystem/Community Management

Today’s biggest skill is **how to manage ecosystems or communities** of firms and customers.
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Problems:
1) Information risk:
How to operate in the face of uncertainties?
Ecosystem/Community Management

Today’s biggest skill is **how to manage ecosystems or communities** of firms and customers.

Problems:

1) **Information risk:**
   How to operate in the face of uncertainties?

2) **Alignment risk:**
   Individual vs. firm’s objectives/incentives

My goal today: Learn how to better deal with these risks
The Newsvendor Model
The Newsvendor Model

Order newspapers overnight to sell tomorrow in the face of uncertain demand.

- High demand
- Low demand

Key features of model: **Make a bet** in the face of uncertainty, **no recall** to your decision, the product is **perishable**
Quantify the uncertainty

When something is uncertain, it has a likelihood to happen.

E.g. “It is 60% likely to rain today”.
   “I may be late to the class”.
Quantify the uncertainty

When something is uncertain, it has a *likelihood* to happen.

Which stock would you invest in?

<table>
<thead>
<tr>
<th>Stock</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>20%</td>
</tr>
<tr>
<td>B</td>
<td>60%</td>
</tr>
<tr>
<td>C</td>
<td>20%</td>
</tr>
</tbody>
</table>
Quantify the uncertainty

When something is uncertain, it has a likelihood to happen.

Which stock would you invest in?

Stock A 20%

Stock B 60%

Stock C 20%

The human mind is particularly bad in understanding something uncertain: most people choose the most likely outcome. This could be wrong!
First key lesson for today

“In the face of uncertainty you do *not* just choose what is most likely to happen”
Two key examples
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Doctor’s decision: How much blood to carry when Justin is on a trip?
Two key examples

Doctor’s decision: How much blood to carry when Justin is on a trip?

99.999%

0 L of blood

0.001%

10 L of blood
Two key examples

Doctor’s decision: How much blood to carry when Justin is on a trip?

0 L of blood 10 L of blood

99.999%

0.001%

What’s the most likely thing to happen?
Two key examples

Doctor’s decision: How much blood to carry when Justin is on a trip?

What’s the most likely thing to happen? (no blood is needed)

99.999%
0 L of blood

0.001%
10 L of blood
Two key examples

Doctor’s decision: How much blood to carry when Justin is on a trip?

What’s the most likely thing to happen?

How much blood do you think they carry for Justin?
Two key examples

Doctor’s decision: How much blood to carry when Justin is on a trip?

What’s the most likely thing to happen?

How much blood do you think they carry for Justin? *(60 L of blood)*

0.001%  
0 L of blood  
10 L of blood
Two key examples

Bookstore’s decision: How many such books to order?

What’s the most likely thing to happen?

How many to stock?

99.999% No books

0.001% 1 book
Second key lesson for today

“In the face of uncertainty you tilt your bet away from the most likely value in the direction where the consequences are less severe”
Second key lesson for today

“In the face of uncertainty you tilt your bet away from the most likely value in the direction where the consequences are less severe”

You don’t simply want to be correct “most often”. You want to be “wrong in the right way most often” (where the consequences are least severe)!
Another example

How many hand-outs to print today?
Another example

How many hand-outs to print today?

“Class size is 50 Students this semester”
How many hand-outs to print today?

What are the consequences of placing the wrong bet?
How many hand-outs to print today?

What are the consequences of placing the wrong bet?

One too many
How many hand-outs to print today?

What are the consequences of placing the wrong bet?

One too many

One too few
Operations = Matching Supply with Demand
How many Wii’s to store (uncertain demand)?

2007
How many Wii’s to store (uncertain demand)?

2007

2008
How many Wii’s to store (uncertain demand)?

2007  2008  2009, etc...
How many Wii’s to store (uncertain demand)?

Global game-console count
In millions of units
Nintendo Wii sales:
FY ’07 5.8
FY ’08 forecast 17.5
Sony PlayStation 3 sales:
FY’07 3.6
FY’08 forecast 11.0

But Nintendo’s forecast was correct! (WSJ ‘07)
Long queues due to shortage
How many Wii’s to store (uncertain demand)?

What could be going wrong?

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The reason for Wii’s demand-supply mismatch

Pros/Cons of being over/lower the demand?
The reason for Wii’s demand-supply mismatch

The presence of information and alignment risks

Pros/Cons of being over/lower the demand?
This intuition is very general
Key things to remember

1) Most business problems are making a bet in the face of uncertainty.
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2) You tilt your bet in the direction where the consequences are least severe.
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3) Who is bearing these consequences? Align the incentives.
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2) You tilt your bet in the direction where the consequences are least severe.

3) Who is bearing these consequences? Align the incentives.

Thank you! Keep in touch: www.stouras.com, @stourask