



EXCElIng in Projection Modeling

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Introduction

- AIR recently reported 80-100% of small IR offices (≤ 3 FTE) are performing enrollment and revenue projections. [Poll]
- Methodologies for building and monitoring projection models utilizing Excel
 - ✓ Integrated Data Retrieval
 - ✓ Markov Chain Approach to Enrollment Projections
 - ✓ Model Performance Tracking
 - ✓ Report Creation



Integrated Data Retrieval



Integrated Data Retrieval

- Quick Poll
 - Which database system does your campus use?
 - How do you get data into Excel for analysis?
 - Did you know you can get Jenabar data into Excel without opening Jenzaber, Infomaker, or any additional software?



Integrated Data Retrieval

The screenshot shows a SQL Enterprise Manager interface. In the background, a table grid displays columns: Id Num, Yr Cde, Trm Cde, Div Cde, Prog Cde, Degr Cde, Class Cde, Ipede, and Eth Cde. The main window shows a query editor with the following SQL code:

```
SELECT mse_re_extra_student_info.id_num,
mse_re_extra_student_info.yr_cde,
mse_re_extra_student_info.trm_cde,
mse_re_extra_student_info.div_cde,
mse_re_extra_student_info.prog_cde,
mse_re_extra_student_info.degr_cde,
mse_re_extra_student_info.class_cde,
mse_re_extra_student_info.ipeds_eth_cde
FROM mse_re_extra_student_info
WHERE (mse_re_extra_student_info.yr_cde = '2018') AND
(mse_re_extra_student_info.trm_cde = 'Q1')
ORDER BY mse_re_extra_student_info.id_num ASC
```

The menu bar at the bottom of the query window includes: Sort, Where, Group, Having, Compute, Syntax. The 'Syntax' option is circled in red.



Integrated Data Retrieval

The screenshot shows Microsoft Excel with a data table and a 'Connection Properties' dialog box open. The data table has the following columns: ID_NUM, YR_CDE, TRM_CDE, DIV_CDE, PROG_CDE, DEGR_CDE. The 'Connection Properties' dialog box shows the following details:

- Connection name: Query from Jenzabar
- Connection type: Database Query
- Connection string: DRIVER=SQL Server Native Client 11.0;SERVER=jenzabarprod.msoe.edu;UID=mejetje;APP=Microsoft Office 2016;WSID=M5OE-CND6334X05;
- Command type: SQL
- Command text:


```
SELECT mse_re_extra_student_info.ID_NUM,
mse_re_extra_student_info.YR_CDE,
mse_re_extra_student_info.TRM_CDE,
mse_re_extra_student_info.DIV_CDE,
mse_re_extra_student_info.PROG_CDE,
mse_re_extra_student_info.DEGR_CDE,
mse_re_extra_student_info.CLASS_CDE,
mse_re_extra_student_info.IPEDS_ETH_CDE
FROM TMSEPRD.dbo.mse_re_extra_student_info
WHERE mse_re_extra_student_info.YR_CDE='2017' AND
(mse_re_extra_student_info.TRM_CDE='Q1')
ORDER BY mse_re_extra_student_info.ID_NUM
```



Integrated Data Retrieval

The screenshot shows an Excel spreadsheet with a table of data and a 'Connection Properties' dialog box open. The table has columns for CLASS_CDE, IPEDS_ETH_CDE, Year, and Term. The dialog box shows the connection string and the SQL command text used for data retrieval.

	G	H	I	J	K	L
1	CLASS_CDE	IPEDS_ETH_CDE				
2	GR	8		Year	2018	
3	JR	2		Term	Q1	
4	SR	8				
5	SR	8				
6	SR	1				
7	GR	8				
8	GR	8				
9	GR	2				
10	SR	8				
11	JR	3				
12	GR	8				
13	GR	5				
14	SR	8				
15	SR	2				
16	SR	8				
17	GR	8				
18	GR	8				
19	SR	8				
20	JR	6				
21	SR	2				
22	GR	6				

Connection Properties Dialog Box:

- Connection name: Query from Jenzabar
- Connection type: Database Query
- Connection string: DRIVER=SQL Server Native Client 11.0;SERVER=jenzabarprod.msoe.edu;UID=meyerje;APP=Microsoft Office 2016;WSID=MSOE-CND6334X05;
- Command type: SQL
- Command text:


```
SELECT mse_re_extra_student_info.ID_NUM,
mse_re_extra_student_info.VR_CDE,
mse_re_extra_student_info.TRM_CDE,
mse_re_extra_student_info.DIV_CDE,
mse_re_extra_student_info.PROG_CDE,
mse_re_extra_student_info.DEGR_CDE,
mse_re_extra_student_info.CLASS_CDE,
mse_re_extra_student_info.IPEDS_ETH_CDE
FROM TMSEPRD.dbo.mse_re_extra_student_info
WHERE (mse_re_extra_student_info.VR_CDE=?) AND
(mse_re_extra_student_info.TRM_CDE=?)
ORDER BY mse_re_extra_student_info.ID_NUM
```



Integrated Data Retrieval

DEMO

Email me for Step-by-Step Instructions for getting SQL into Excel
meyerje@msoe.edu



Integrated Data Retrieval

- Model tracking is important for model improvements.
- Efficient and timely tracking of data and model projection allows for model tracking.
- Can be used for administrators, faculty, and staff that are not comfortable with Infomaker or other software, but have comfort in Excel.



Projection Modeling

- What are we projecting?
 - Enrollment
 - Credit Hours
 - Revenue
- When are we projecting?
 - Creation of Initial Budget
 - Monitoring of Budget Achievement



Markov Chains for Enrollment Projections



Markov Chains

- Equation used to describe population changes over time
- Used in chemistry, biology, and finance
- Groups must be exhaustive and mutually exclusive
- Estimates the probability of moving from one state to another, or remaining the same
 - Probabilities are arranged in a $N \times N$ Transition Probability Matrix



Markov Chains

Number of students we have this semester in each state at time t \times Probabilities of moving amongst each state = Estimated number of students in each state next semester/fall

$$[F_t \quad S_t \quad J_t \quad R_t] \times \begin{bmatrix} P_{FF} & P_{FS} & P_{FJ} & P_{FR} \\ P_{SF} & P_{SS} & P_{SJ} & P_{SR} \\ P_{JF} & P_{JS} & P_{JJ} & P_{JR} \\ P_{RF} & P_{RS} & P_{RJ} & P_{RR} \end{bmatrix} = [F_{t+1} \quad S_{t+1} \quad J_{t+1} \quad R_{t+1}]$$

➔ What's missing?



Markov Chains

Key
 NH Not Here
 FRF Freshman, Full-time
 FRP Freshman, Part-time
 SOF Sophomore, Full-time
 SOP Sophomore, Part-time
 JRF Junior, Full-time
 JRP Junior, Part-time
 SRF Senior, Full-time
 SRP Senior, Part-time

Class Level	NH	FYF	FYP	SOF	SOP	JRF	JRP	SRF	SRP	Row Total	Input 1	
NH	0%	78%	1%	9%	1%	7%	0%	4%	1%	100%	851	NH
FYF	17%	3%	0%	77%	0%	2%	0%	0%	0%	100%	613	FYF
FYP	56%	11%	0%	11%	22%	0%	0%	0%	0%	100%	6	FYP
SOF	11%	0%	0%	10%	0%	75%	1%	2%	0%	100%	590	SOF
SOP	43%	0%	0%	14%	14%	14%	14%	0%	0%	100%	24	SOP
JRF	7%	0%	0%	0%	0%	6%	0%	86%	1%	100%	669	JRF
JRP	14%	0%	0%	0%	0%	11%	46%	14%	14%	100%	16	JRP
SRF	85%	0%	0%	0%	0%	0%	0%	12%	3%	100%	641	SRF
SRP	72%	0%	0%	0%	0%	0%	0%	2%	26%	100%	46	SRP
Output 1	814	682	6	615	16	557	19	701	46	2642		

Email me for Step-by-Step Instructions for creating Markov Matrix in Access for input into Excel
 meyerje@msoe.edu



Markov Chains

Class Level	NH	FYF	FYP	SOF	SOP	JRF	JRP	SRF	SRP	Row Total	Input 1
NH	0%	78%	1%	9%	1%	7%	0%	4%	1%	100%	851
FYF	0%	78%	1%	9%	1%	7%	0%	4%	1%	100%	851
FYP	0%	78%	1%	9%	1%	7%	0%	4%	1%	100%	851
SOF	0%	78%	1%	9%	1%	7%	0%	4%	1%	100%	851
SOP	0%	78%	1%	9%	1%	7%	0%	4%	1%	100%	851
JRF	0%	78%	1%	9%	1%	7%	0%	4%	1%	100%	851
JRP	0%	78%	1%	9%	1%	7%	0%	4%	1%	100%	851
SRF	0%	78%	1%	9%	1%	7%	0%	4%	1%	100%	851
SRP	0%	78%	1%	9%	1%	7%	0%	4%	1%	100%	851
Output											
SRF	JRF	SOF	FYF								613
SRP	JRP	SOP	FYP								6
Output	SRF	JRF	SOF								590
SRP	JRP	SOP	FYP								24
Output	SRF	JRF	SOF								669
SRP	JRP	SOP	FYP								16
Output	SRF	JRF	SOF								641
SRP	JRP	SOP	FYP								46
Output 1											2642

Create a 3- or 5- year average to account for variability.



Markov Chains

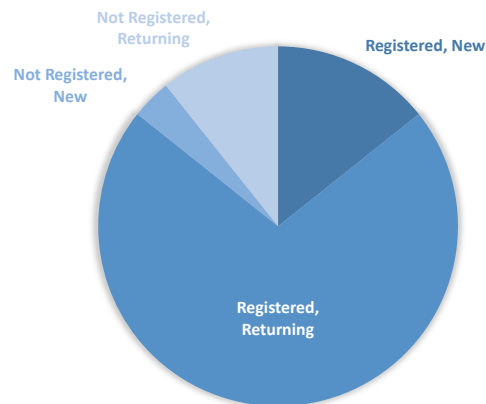
- Great for simple projections.
- Found to be highly accurate with accurate projection of incoming class.
- Can also be used to better understand time to completion, retention, persistence, and financial aid modeling.



Projection Modeling



Projection Modeling





Projection Modeling

DEMO

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Projection Modeling

- Key Excel Components
 - Hide Tabs
 - Formulas and Formatting
 - Vlookup
 - Set Print Area
 - Lists
 - Data Validation



Report Creation

- AIR recently reported 80-100% of small IR offices (≤ 3 FTE) are performing enrollment and revenue projections.
- Methodologies for building and monitoring projection models utilizing Excel
 - ✓ integrated data retrieval
 - ✓ model performance tracking
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Questions?

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