

AN AUTOMATED ENROLMENT PROJECTION SYSTEM

by

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A thesis submitted in conformity with the requirements  
For the degree of Doctor of Philosophy  
Graduate Department of Theory and Policy Studies in Education  
Ontario Institute for Studies in Education  
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**Doctor of Philosophy 2011**  
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**Abstract**

From my own experience working in Institutional Research for the past seven years, there is not a proper, reliable, and comprehensive model for forecasting student enrolment quickly. In many funding formulas, enrolment is the main driver of government grants and student tuition fees, which are sources of income to the university. Existing enrolment management tools developed within Institutional Research departments tend to be “ad hoc” spreadsheets with multiple individuals manipulating them with the result that the output comes too late for departments to take remedial action in terms of their budgets and does not provide multiple scenarios in support of strategic decision-making.

The purpose of this study is to describe a functional automated enrolment projection system methodology I developed from scratch through a case study of the Faculty of Arts & Science at the University of Toronto. My primary research was to actually build the model. The model in effect, is the thesis. The system provides multiple scenarios that allow senior management in a multi-campus university system to generate multiple income scenarios, enabling them to make well-informed decisions concerning the operation of their institution and timely calculation and allocation of resources to academic departments. The study then shows how this addresses the problems of “ad hoc” approaches, and how it may be applied in other situations.

## **Acknowledgements**

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Dan Lang & Thesis Committee Members

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My Parents

I would like to thank my parents Bill (1943-2005) and Marie for providing me with a very stable, consistent, and supportive upbringing, free from financial and emotional drama, that allowed me to focus my energy on pursuing my education to the fullest.

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I would like to thank Mr. Sax who taught me Grade 10, 11, and 12 computer studies in high school, and helped me find my interest in computers and computer programming. Although the programming languages and software I learned are long obsolete, the concepts and techniques continue to apply.

### Acknowledgements Continued

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Rodney Branch	Director of Information Systems	School of Graduate Studies
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# 1. Introduction

Enrolment management is an emerging but still imperfect practice, and some of the North American bodies that oversee it are the Association of Institutional Research (AIR) in the United States, the Canadian Institutional Research and Planning Association in Canada, and the Council of Ontario Universities' Council of University Planning Analysis in Ontario. Some of the complexities in enrolment management include faculty workload, space planning, faculty hiring (tenure, non-tenure, contract instructors, and teaching assistants), course section sizes, student retention rates, attrition rates, year-over-year flow-through rates, converting student enrolment to full-time equivalents and income units for the purpose of calculating grant and tuition income. In the case of Ontario, the rules for reporting enrolment to the Ontario government are provided in the Ontario University Statistical Users Report and Ontario Operating Funds Distribution Manual (Ontario Government, 2009 1 and 2). Different types of students generate varying levels of grant income as well as pay different tuition fees depending on the program of study, whether they are international or domestic, graduate or undergraduate, and how long they have been enrolled in a program as outlined by the Ministry. Arrangements such as these through "weighted" enrolment-driven funding formulas are in frequent use throughout North America.

In Ontario, as in many other jurisdictions, enrolment is the main driver of government grants and student tuition fees. Existing enrolment management tools developed within Institutional Research departments tend to be "ad hoc" spreadsheets. For example, one individual determines student enrolment, provides their spreadsheet to another individual who calculates FFTEs (Full-time equivalents) in a secondary

spreadsheet. This secondary spreadsheet becomes an input to a third individual's spreadsheet used to calculate the government grant and tuition fees.

Problems arise with these “ad hoc” spreadsheets when any kind of change occurs, and create delays in feedback to academic units and departments. Some examples of problematic changes include changes in complexity where users want more detail than the spreadsheets can handle, the introduction of new programs or new academic departments, government policy changes, policy changes within the institution, student administration system upgrades, and the lack of continuity of individuals who manipulate these spreadsheets. The reason for these problems is that spreadsheet technology is limited in terms of size, those who build and manipulate them have varying technical expertise, and developers seldom produce manuals and documentation within these spreadsheets. This is especially crucial if assumptions are made and values are simply inserted, without critical or strategic explanation. Once one of the individuals involved in a spreadsheet leaves, a new individual must build the spreadsheet from scratch in the absence of documentation. Since academic units and departments need accurate allocations to be made prior to upcoming academic sessions, delays in feedback can leave no room for corrective action on the part of the academic department. For example, if resource allocations to academic departments are made based on student enrolment targets, a department needs to be informed immediately if targets may not be met so remedial action can be taken. This is crucial if Responsibility Centered Budgeting / Responsibility Centered Management (RCB/RCM) or some other variant of flow-through budgeting is the budget model used by the institution. If divisions and departments are

notified too late in the process, there is nothing they can do, especially if they have already hired tenured faculty. As a result, the university can incur a deficit.

Flow through budgeting involves flowing revenue through a system using the method by which it was generated. For example, suppose the education system is organized in a hierarchy with the government being highest, followed by the institution, its divisions, its departments. If the revenue is allocated to institutions using a funding formula, they transfer it down to the next level in the hierarchy using the same formula. Individuals at the next level pass it down the same way. Another variant of flow through budgeting involves flowing revenue through to a certain level in the system, then applying an alternate allocation mechanism to it at some point. For example, the division in the example above decides to flow the revenue through to its departments, but change the program weights to what it feels are adequate or more accurate.

In 2006-07, the main development that in large part, gave rise to the need for developing a model to project revenue in the Faculty of Arts & Science at the University of Toronto was the new budget model, which placed additional demands on divisions in terms of revenue and expenditure. The new budget model is a variant of RCB/RCM, which has the following principles. The first principle is that all revenues (net of contribution to university-wide central costs) generated by a division are attributed to that division, appear in its budget, and are under its control. The second principle is that each division now has an incentive to increase revenue, and control costs according to its own priorities. The third principle is that decisions about tuition fees (within government guidelines) and enrolment are delegated to divisions. The fourth principle is that line item budgets are relaxed or eliminated allowing each division to allocate the global

revenue base available to it (Lang, 1999 p. 2-3). The Faculty of Arts & Science was forced to start linking their activities to revenue generation, but was not equipped to do so.

The graduate expansion program by the Ontario government, following recommendations in the 2005 Rae Review basically allowed universities across the province to expand domestic enrolment in their masters and doctoral programs over and above 2004-05 levels, such that Ontario could compete with its counterparts in the United States in terms of per-capita advanced degree holders (Rae, 2005 p. 10). The Dean at the time chose to allocate \$10,000 for growth in fall BIU-eligible FFTEs over fall 2004 to departments as a means of encouraging them to admit more graduate students. This decision is an example of an alternate allocation mechanism, and also made it necessary to have a model that was capable of projecting graduate enrolment at the departmental level. The concept of BIU-eligible FFTEs will be described in detail later in this thesis. Basically, some FFTEs attract funding to the institution from the Ontario government, while others do not, based on specific eligibility criteria.

In higher education, many universities that choose to implement RCB/RCM have difficulty navigating through the data needed to support it, making it a disadvantage of RCB/RCM. The purpose of this chapter is to give focus to a model developed that enabled Arts & Science to navigate through the two developments above. Throughout this thesis, the Faculty of Arts & Science will be referred to as FAS, and the University's planning and budget office will be referred to as P&B. Full-time equivalents are referred to as FFTE. Revenue is mentioned throughout this thesis, and consists of operating

grants and tuition fees. Revenue streams outside of operating grant and tuition fees such as investment income and incidental fees are not part of the model.

The enrolment projection model presented in this thesis operates at a very detailed level, and can be aggregated to higher levels to serve different audiences. The order of these levels can be thought of as a hierarchy. For example, some of the data elements in the hierarchy from highest level of detail to lowest include campus, division, department, degree type, and year level. Most universities are arranged this way, making the model very portable. The model is able to report combinations of detail that are not necessarily in hierarchical order. For example, the model can show first-year projections for the entire division, even though year level is more than one step down the hierarchy from division. This ability to report different aspects and combinations of the hierarchy makes the model highly flexible.

The variant of RCB/RCM used at the University of Toronto, currently operates down to the divisional level in the hierarchy. Although Deans can use their own discretion in flowing divisional budgets to departments, the model makes flow-through budgeting possible if the Dean wanted to step the variant of RCB/RCM down to the departmental level in the future. The model presented in this thesis can generate grant and tuition revenue by department. This revenue could then be calculated net of central costs and FAS administrative and local space costs (e.g. the cost of the administrative salaries in the Dean's office). This net revenue could then be transferred to each department, and require each department to be responsible for managing their costs (e.g. teaching salaries, admin salaries, benefits, non-salary operating).

## **Existing Systems**

Prior to 2006-07, FAS had not made any attempt to project revenue because divisions were provided with incremental budgets, whose magnitude was not necessarily linked to the level of revenue generated by those divisions. FAS would simply provide aggregate headcount numbers to the central administration, who would convert the headcounts into revenue through consultation with P&B. The introduction of the new budget model basically forced divisions to start thinking about adjusting levels of activity commensurate to revenues generated. Therefore, there was a need to forecast revenues based on different enrolment levels.

Two problems began to emerge due to the budget model change, which are also problems faced by large research-intensive universities implementing RCB/RCM. The first problem was that FAS needed to gain an understanding of how enrolment generated revenue at the graduate and undergraduate levels, and to determine its impact by changing enrolment in different programs. Another element that complicated this problem was the fact that the university-wide enrolment projection model was not designed, or intended to, step the data down to the departmental level.

The second problem was the inability to know in advance whether enrolment targets would be met for the upcoming fall. The divisional budgets were set university-wide in spring, and were based on aggregate graduate and undergraduate enrolment targets provided by divisions, with an adjustment to actuals in late fall. If the targets were not met, the adjustment to actuals would be negative, and could result in a deficit. Since a university-wide draft count is produced in early fall and a final count in late fall, it was impossible for divisions to take remedial action, as the funding year starts in May

and the academic year starts in September. FAS needed a means of monitoring the upcoming fall enrolment and associated revenue by department, as well as being able to run enrolment scenarios to project revenue, and see the impact on the overall budget.

This thesis is similar to doctoral research in mathematics or physical science in the sense that the model is built *de novo*. The hypothesis for constructing the model will be based on secondary research conducted into existing research literature and related experiences in other universities, especially those that deploy RCB/RCM or variants of it. The model is then tested against actual experience of its use in the Faculty of Arts & Science at the University of Toronto.

## **The Model**

Universities are typically producers of knowledge. They admit students and educate them, transferring knowledge to them. Graduates either enter the workforce or continue in academia. Faculty members at universities participate in research, and contribute to bodies of knowledge, through scholarly publications. Public universities are typically funded through tuition fees and grants, while private universities are funded mainly through tuition fees and donations from industry and/or alumni.

Planning at universities typically involves a series of steps arranged in a loop. The first step is to set a mission or mandate. The second is to set goals that address things to add to the mission, or shortcomings of the mission. This step is concerned with change. The third step is to set objectives, which attach deadlines to things. For example, a university may wish to have a new program up and running by a certain time. The fourth step is planning and budgeting, and is often a source of frustration across all

levels of the institution. This step must link budgets and priorities of different groups within the university. Keller's findings indicate that some schools have academic plans, but these plans tend to reject the idea of scarcity, making them wish lists. Therefore, academic plans are usually not good control devices in universities, making it difficult to link plans and budgets (Keller 1983, p. 99-100). Mintzberg finds that information for planning may be accurate but too late, it may be timely but too highly aggregated, and it may be too difficult for decision-makers to comprehend (Mintzberg 1998, p. 70-71). The model presented in this thesis is essential in this step because it can quickly compute the revenue generated by different kinds of enrolment at high and low levels of detail automatically. The model can be used as a decision support tool, providing advice to those developing academic plans. For example, if the institution's costs are C dollars, and they want to run three enrolment decrease scenarios (steep decline, moderate decline, and slow decline); the model can quickly generate the revenue, and advise management on which scenarios cover costs. In a broad sense, the model is one of only a few quantitative means of linking plans and budgets, and force priorities for "wish lists", and it solves Mintzberg's problem of timing and aggregation.

The fifth step is implementation. For example, a new program has just started, and resources need to be allocated so that it can run and begin admitting students. The model is cybernetic as a control device in the sense that it can be used to check upcoming fall data to determine whether targets will be met. If the preliminary actuals fall short of targets, the registrar could be alerted to admit more qualified students, as a remedial step. This warning capability is currently used for graduate departments.

The sixth step is the evaluation. Tools such as performance indicators can be used to see if objectives are being met, and how they compare to other similar universities. For example, the model could be used to see how many students are repeating first-year. This step can also determine whether a university mission statement continues to be appropriate. For example, suppose a polytechnic university had a mission statement consisting of being a leader in polytechnic education and workplace preparation. If through evaluation, it is found that the university has become more research intensive, the mission may need a revision, such as the removal of the word “polytechnic”. Overall, the evaluation step closes the loop. The model can be used as a decision support tool in this step to determine when the mission should change, through the revenue projection of polytechnic programs and research intensive programs. Senior management may wish to change the mission statement once research intensive programs make up 70 percent of revenue generated, but leave it alone in the meantime.

From several years of working in institutional research, the enrolment models in the form of spreadsheets were cumbersome to work with. These spreadsheets were often “ad hoc” with little documentation, had multiple users manipulating formulas in them with varying technical expertise, and users making judgements in order for the numbers to make sense (for example, using a two year moving average instead of three for program X, but using a different moving average for Y and Z). Any kind of change such as the inclusion of a new department or degree type involved inserting lines on several dozen tabs. In order to run scenarios, data elements often times had to be re-keyed from other sources. More work was involved in the maintenance and repetitive debugging of spreadsheets than actually using them as analytical tools to inform decisions. When it

became time to insert the next year's data into the model, calibration of all of the factors would involve working through a daunting update list, highly prone to human error. For example, inserting a new graduate department would involve manually inserting it on all of the enrolment projection model tabs, and all reports that are produced from enrolment projections. Adding a new year would complicate the process due to inserting columns and formulas. During the update or any use of large spreadsheets, they could crash, causing formatting to be lost without warning. The process was highly prone to error because deadline time could shrink with short notice, as demands for output increased. The result was often providing a number quickly to meet demand, hoping the formulas were updated correctly. For example, the computer science department decides to submit a proposal to create a professional masters program in applied computing, and requires enrolment projections immediately as part of their application. Another example is the Ontario government deciding that there are too many doctoral spaces in the province and not enough masters. The government decides to ask institutions to voluntarily reduce doctoral intake, and report back in three days. Institutions are required to run scenarios to see how much they can go down. Both of these are examples of requests that could take up a lot of time and resources on little notice, moving them away from day-to-day tasks. The more automated the projection model is, the better it can handle such requests quickly. Given past experiences, an automated approach was the optimal way to serve the needs of FAS, as well as provide peace of mind, eliminating the possibility of human error on the part of the model, regardless of how variable deadlines become.

The overall research agenda involved first seeing a lack or problem based on work experience, and then determining on the basis of a review of the literature that there was no existing documented solution, so the model was created and tested in this thesis.

The model would be built to serve a wide variety of stakeholders such as the Dean, Vice Dean, CFO, and department chairs, requiring information at varying levels of detail. For example, the department chair may want to see figures broken down by department and degree type, while the Vice Dean may only be interested in a departmental breakdown. The model can be thought of as one assembly line with the ability to build different kinds of cars arranged in any order. For example, car A might be first, followed by two of car B, and three of car C. Among the multiples of the same car, certain options may be included in production, depending on what the buyer ordered. The first B may have a sunroof, while the second may not. Bringing this analogy into the university setting, first-year students in department X, degree type Y may behave differently than upper-year students in the same department and degree type in a number of different aspects. Some of these students may generate full grant for the institution, while others may generate only half.

The model relies on two main assumptions. The first is that history repeats itself, for example, fourth-year doctoral students in department X, degree type Y will behave in the future as they did in the past. The second assumption is that where a detailed factor does not exist for a new program, it will use data at higher levels of detail, until a factor is found. Each input has other specific assumptions that will be explained later in their respective chapters of this thesis.

The controllable data elements in the model are headcount and tuition fees. Headcount ultimately drives tuition revenue and grant revenue defined by the Ontario operating grant formula. The source code in the model is written as a series of modules, and overrides can be built in to bypass factors to test a desired scenario. For example, if FAS wanted to run scenarios based on different course intensification assumptions, the conversion of headcount to full-time equivalents could be modified by another module to achieve the desired scenario.

The model takes six inputs and prepares them for entry. These inputs include the enrolment submission to the government referred to as “enrolment headcount data”; fall enrolment targets (graduate targets are set by department, but approved by the Dean’s office, undergraduate targets set by the Dean); student cancellation rate data; commerce course data used in determining which first year students can be claimed to the government as being enrolled in commerce; upcoming fiscal year extract data; and tuition fee tables. The preliminary processing also includes the imputation of data elements that exist in some inputs, but not others. For example, the undergraduate targets are provided at the divisional level of detail, and need to be spread down to a departmental level for the purpose of applying differential tuition fees. Tuition fees are regulated in Ontario, but some programs such as commerce are allowed to charge higher fees and apply higher tuition fee increases for new students. The rationale for charging higher fees is that it costs more to run a commerce program because faculty salaries are higher than in other areas such as humanities. In addition, students are expected to earn higher starting salaries when they graduate from commerce as opposed to some of the humanities. Once the inputs are ready, they are sent through the model, producing a cube consisting of

actuals and projections spanning several measures including grant, tuition, full-time equivalent, and headcount.

The stakeholders in the model include the Dean, Vice Dean Research & Graduate Programs, and Chief Financial Officer. They consult with one another to discuss various internal financial issues within the division at weekly meetings. Scenarios are typically run to see the financial impact on operating grant and tuition from changes in enrolment (overall levels as well as mix by degree type), tuition fees within government regulations, or the possible growth rate in future tuition fees. The Chief Financial Officer takes the output and inserts the figures into the budget to see the impact on the net revenue for the division. The budget includes additional revenue streams such as investment income that are beyond the scope of the model. The model does handle all operating formula grants and non-operating formula grants. University-wide costs, the University Fund, and student aid set-aside are linked to revenue outside the model, and are also beyond the scope of the model. In terms of time and expense, the following illustrates the frequency and length of each input update:

**TABLE 1: Time and Money Demands of the Model**

Input	Frequency	Time Needed per Model Run	Money Demands	Source
MTCU enrolment headcount data	Once every four months.	4 hours	None	Planning & Budget Office
fall target data	Once a year, or when scenarios are requested with different enrolments.	2 minutes	None	FAS departments
student cancellation data	Once a year, prior to the upcoming fall.	1 hour	None	ROSI
pre-requisite Commerce course data	Once a year, prior to the upcoming fall.	30 minutes	None	ROSI
upcoming fiscal year extract	Weekly between July and mid November on Sunday evenings.	5 minutes	\$15,000 one-time-only to develop	ROSI
tuition fee tables	Once a year, in spring.	30 minutes of keying in new actuals	None	Governing Council

## **Output**

The model generates a cube as outlined below that could be uploaded to the web for data dissemination purposes. Software such as COGNOS or Beyond 2020 could be used for data dissemination. Currently, SPSS is used to produce desired output tables for stakeholders, but any combination of the elements below can be used to produce an output. The model is deterministic, and is designed to project revenue, but does not contain criteria for optimization and maximization, as they were not asked for. If criteria for optimization became necessary, modules would need to be built to check for

constraints and adjust enrolment accordingly. For example, if there was an upper limit on total enrolment, new intake would need to be adjusted by the model to stay within the constraint. Currently, scenarios are run, and their output is compared outside the model in order to determine the maximum or optimal grant and tuition. This thesis along with the source code would enable someone to run and/or modify the model to serve other purposes, such as drilling down to see how much revenue would come with first-year commerce students 3 years in the future, and comparing it to the latest actual. The model is able to project graduate enrolment by allowing for a mix by department, domestic or international, full-time/part-time, and degree type. On the undergraduate side, the model projects enrolment by domestic/international, full-time/part-time. Although the model only has jurisdiction in Arts & Science, it is fully capable of being expanded to serve the entire university, including the Mississauga and Scarborough campuses.

**TABLE 2: Model Data Elements Summary**

Data Element	Definition	Possible Values
measure	Headcount Fall full-time headcount Fall part-time headcount Average Fall Winter Headcount BIU Eligible FFTE (eligible for grant) Fall FFTE FFTE (3-term) Basic Income Unit (BIU) (3-term) Basic Operating Income using effective BIU Basic Operating Income using BIU value Formula Fee Grant using effective BIU Grant using BIU value Gross tuition Provision - fees collected in arrears Provision - Doc 5 adjustment Provision - Uncollected fees Tuition = Gross Tuition less the 3 provisions Total grant and tuition using effective BIU Total grant and tuition using BIU value	N FALL_N_FT FALL_N_PT NAVG EFFTE FFFTE FFTE BIU BOI_EFF BOI_VAL FFEE GRANT_EFF GRANT_VAL TU_GROSS TU_COLL TU_DOC5 TU_UNCOLL TUITION TOTAL_EFF TOTAL_VAL
t	Term	1 (summer), 2 (fall), 3 (winter)
unit	Undergraduate or Graduate	UGRD, GRAD
division	FAS	FAS
forpos	Government program categories	100 thru 400 series
campus	UTSG	UTSG
sector	Departmental grouping	Arts, Commerce, Humanities, Social Science, Science
department	Over thirty graduate departments; seven undergraduate departments	Over thirty graduate departments; seven undergraduate departments

ftprgst	Full-time and Part-time status based on the government's definition	FT or PT
degree_type	bachelor, masters, MVS Visual Studies, etc.	Same as definition
degree_type_aggregate	Further aggregation of degree_type with Prof Masters denoting all professional masters programs	Same as definition
dom_intl	Domestic or international status	DOMESTIC or INTL
feecatx	Denotes BIU Eligibility	ELIGIBLE or INELIGIBLE
hl_fee	Denotes whether students are paying Domestic or international tuition fees	HI_FEE or LOW_FEE
new	Denotes whether a student is new to the university	0 (returning) 1 (new)
campus_incidental	Denotes the campus to which a graduate student has chosen to affiliate with	UTSG, UTM, UTSC
funded_cohort	Denotes whether a graduate student is eligible for internal funding	Y or N
course_band	Denotes whether an undergraduate is taking between 3 and 4 FCE for the purpose of program fee implementation	0 or 1
regtype	Registration type	Same as definition
t[1,20], a [1,20], bf[1,20], af[1,20]	Targets, Actuals, Before Finca, After Finca; spanning 20 years starting in 2000-01.	data

### Model Flowchart

A flowchart presentation of the model was produced following this page. Part A illustrates the origin of the inputs and how they are prepared for entry into the model. Part B illustrates how the model takes those inputs and produces the output cube.

An Automated Enrolment Projection System

Flowchart

By

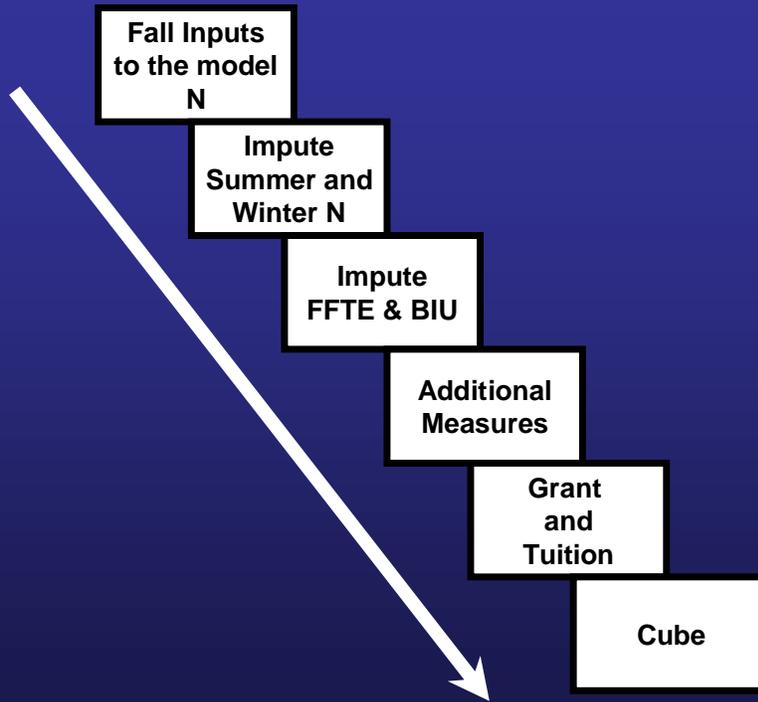
David Gasteiger

OISE Theory and Policy Studies

## (i) Introduction

- **Purpose:** To provide rapid and accurate enrolment projections as well as fall count anticipation as early as summer.
- **Advantage:** Automatically detects new programs, new counts, can be updated at the push of a button.
- **Software Application:** SPSS
- **Users:** CFO, Vice Dean, Registrar, Dean.

## (ii) The Big Picture



3

## (A) Input Derivation

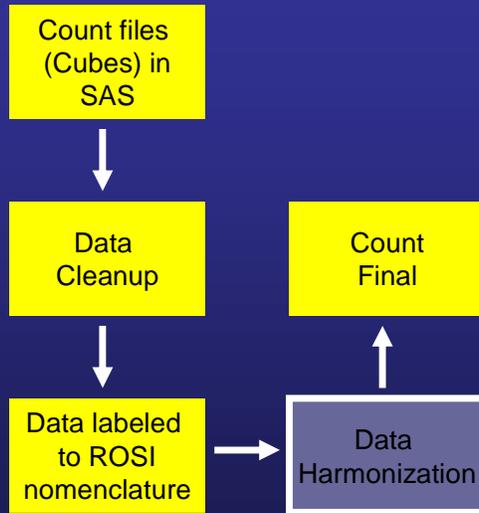
- **Count Files** – historical MTCU count submissions (Cubes) back to 2000-01
- **Target File** – Graduate Enrolment targets submitted by graduate departments. Undergrad targets negotiated between the Dean and Planning & Budget
- **Extract file** – Current year enrolment extract from ROSI, updated weekly
- **Commerce Pre-requisite Course History** – historical year 1 commerce pre-requisites
- **Financial Cancel (FINCA) Data** – ROSI extract from 2005-06 through 2009-10 inclusive
- **Tuition File** – Tracked in MS-Excel going back to 2000-01, converted to SPSS for the model

# Input Colour Coding

Count	Commerce Pre-requisite Course History
Target	Extract
FINCA CANC	Tuition

Data Harmonization (one or more of)  
(1) Assigning new fields  
(2) Renaming existing fields for model  
(3) Applying count rules where applicable

# (1a) First Input: Count File

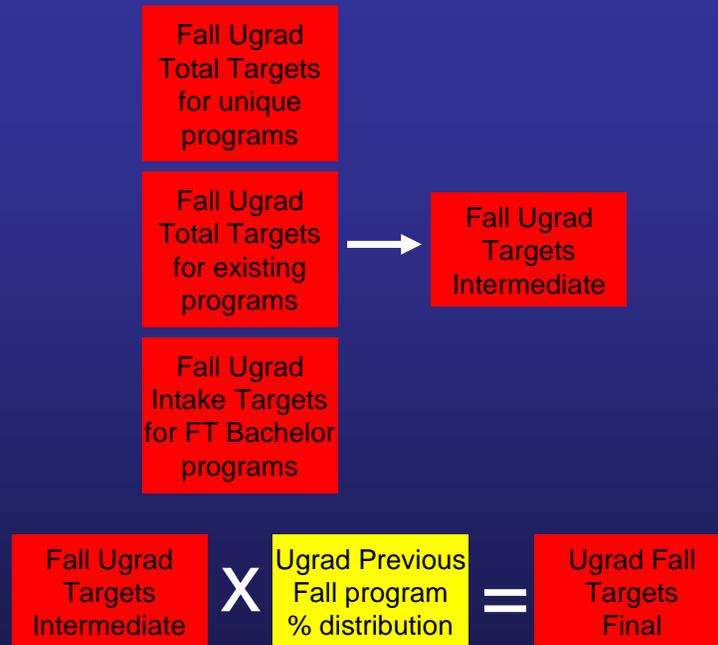


## (1b) First Input: Count File Tables

Headcount Based Tables		FFTE Based Tables	BIU Based Tables
Historical Headcount [ a ]	Ugrad Previous Fall program % distribution	FFTE (Full-Time Equiv) [ a ]	BIU (Basic Income Unit) [ a ]
Grad Fall Specials & PT Headcount	BIU Eligibility Rates	Average FFTE Rates	Average BIU Rates
Summer Over Previous Fall Rates	High/Low Fee Rates		Grad most recent Winter BIU
Winter Over Fall Rates	Funded Cohort Rates		Grad most recent Summer BIU
Year-over-year Flowthru and Repeat Rates	Course Band Rates		
	Campus Incidental Rates		

NOTE: All tables contain 3-term Undergraduate and Graduate actual data unless specified in their title. [ a ] denotes actuals

## (2a) Second Input: Undergrad Targets



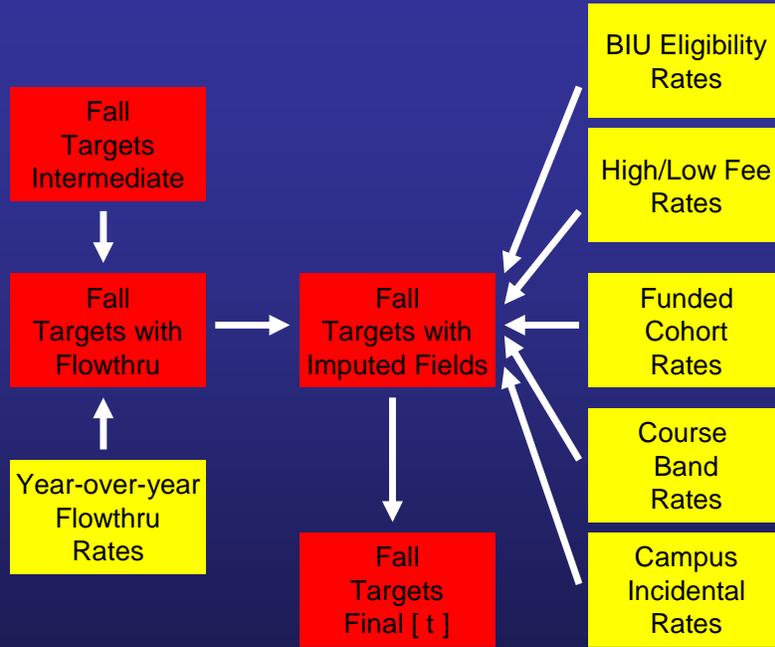
## (2b) Second Input: Graduate Targets



## (2c) Second Input: Combined Targets



## (2d) Second Input: Imputed Targets



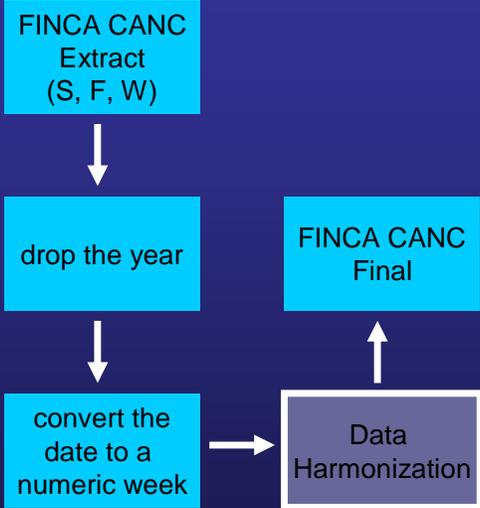
NOTE: Headcount target is denoted by [ t ]

### **(3a) Third Input: Finca File**

**FINCA** is an acronym for Financial Cancel, which is applied to an entire student record when payment has not been received by the deadline.

**CANC** is an acronym for Cancellation, which occurs when a student withdraws from a program.

### (3b) Third Input: Finca File



## (4) Fourth Input: Commerce Courses

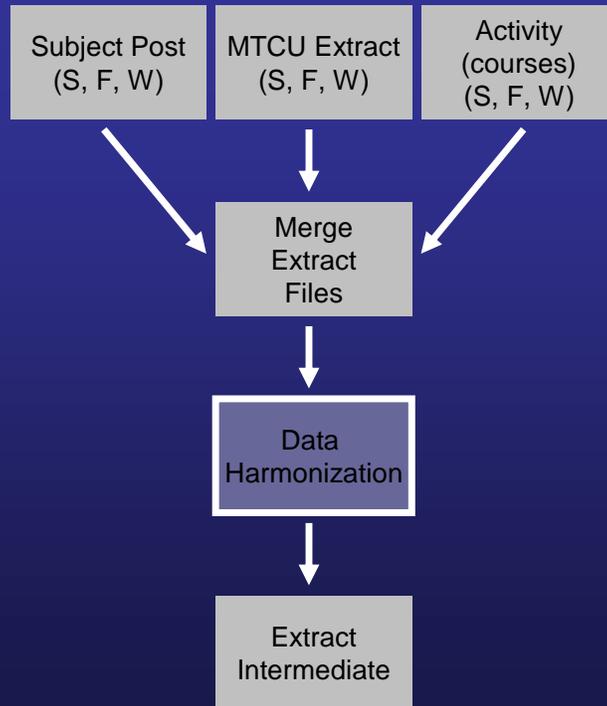
Commerce  
Pre-requisite  
Course History

## (5a) Fifth Input: Extract File

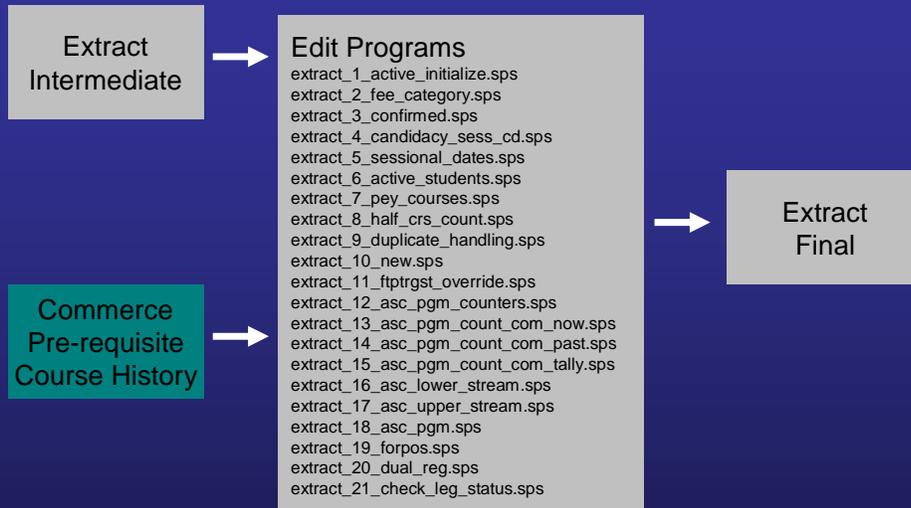
The ROSI Extract contains:

- MTCU extract fields
- Subject Post (subject)
- Activity (courses)
- Cumulative BIU Table for graduate students to be used later

Grad  
Cumulative  
BIU Table



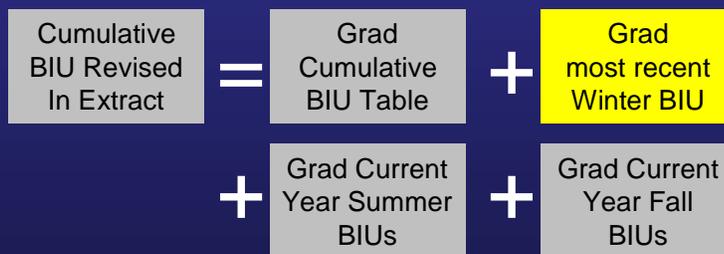
## (5b) Fifth Input: Data Processing



## (5c) Fifth Input: Cumulative BIU Logic

Since the Cumulative BIU table is not updated at the same time the MTCU count is submitted, the following logic holds depending on the time of year:

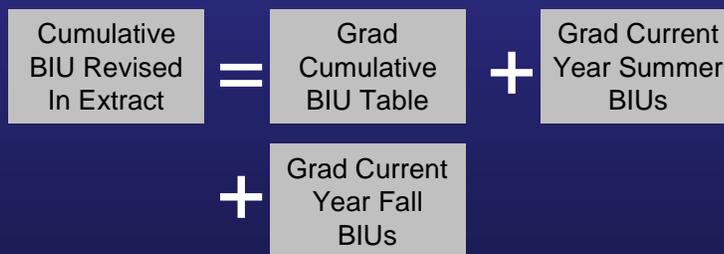
Case 1: The MTCU Count was last updated last winter (20071). The BIU table is up-to-date as of last fall (20069).



## (5d) Fifth Input: Cumulative BIU Logic

Since the Cumulative BIU table is not updated at the same time the MTCU count is submitted, the following logic holds depending on the time of year:

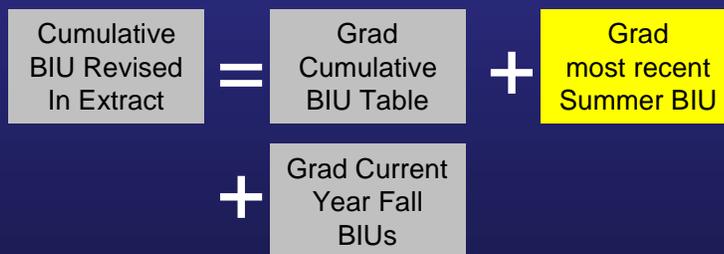
Case 2: The MTCU Count was last updated last winter (20071). The BIU table is up-to-date as of last winter (20071).



## (5e) Fifth Input: Cumulative BIU Logic

Since the Cumulative BIU table is not updated at the same time the MTCU count is submitted, the following logic holds depending on the time of year:

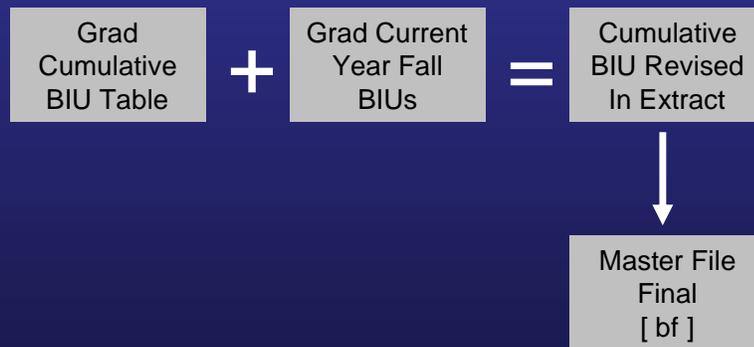
Case 3: The MTCU Count was last updated in summer (20075). The BIU table is up-to-date as of last winter (20071).



## (5f) Fifth Input: Cumulative BIU Logic

Since the Cumulative BIU table is not updated at the same time the MTCU count is submitted, the following logic holds depending on the time of year:

Case 4: The MTCU Count was updated for (20075). The BIU table is up-to-date as of (20075).



## (5g) Fifth Input: BIU Eligibility

Necessary Conditions for students' BIU Eligibility:

- (1) Legal status is Domestic
- (2) Special cases where legal status is International, but student pay the domestic fee
- (3) BIUs have not been maximized for a given formula post category as outlined by MTCU\*:

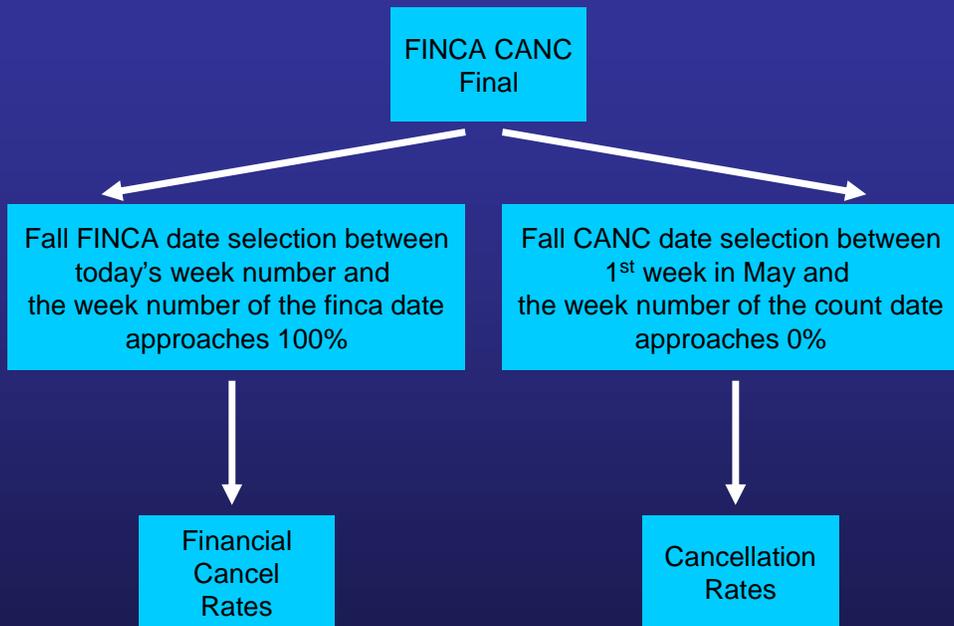
27 allowed for PhD (BIU weight is 2.000)

8 allowed for Masters where the BIU weight is 1.333

6 allowed for Masters where the BIU weight is 1.000

- \* Prior enrolment in a masters program in a given formula post category counts towards the PhD BIU maximum

## (5h) Fifth Input: Finca / Canc Rate Setup



NOTE: "Before Finca" headcount is denoted by [ bf ]

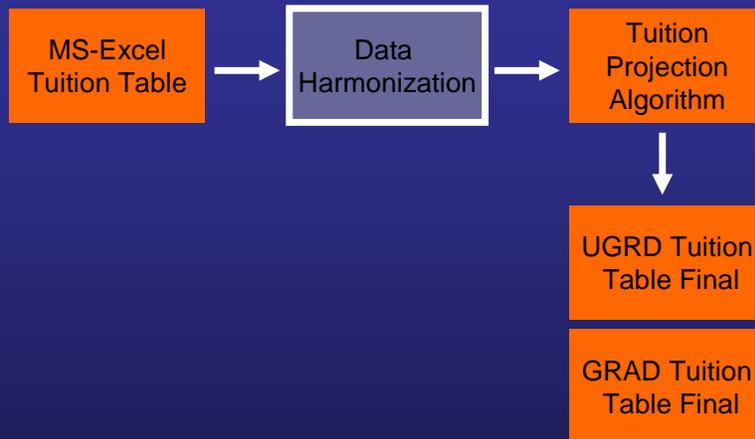
## (5i) Fifth Input: Finca / Canc Rate Applied

**Invited Population** – Students who have not paid their tuition. Financial Cancel Rates are applied to this population.

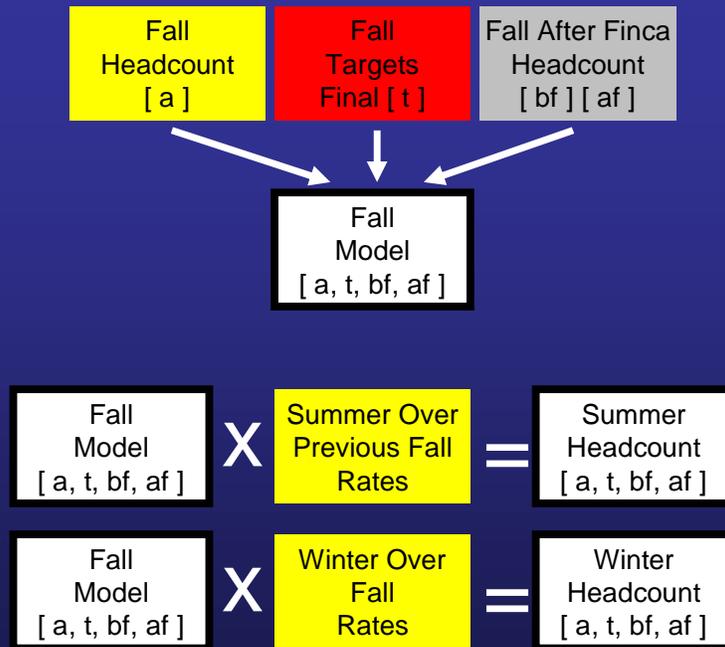
**Registered Population** – Students who have paid their tuition. Cancellation Rates are applied to this population.



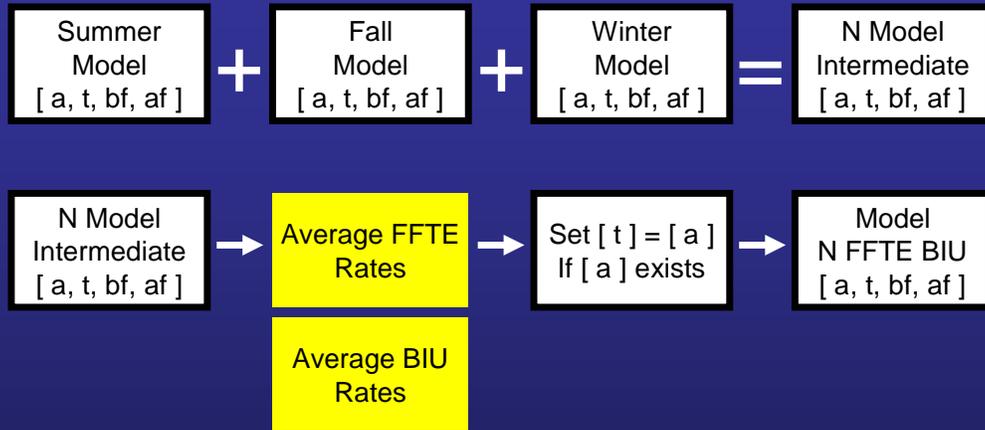
## (6) Sixth Input: Tuition File



## (B) The Model



# (1a) Aggregation of the Model



## (1b) Data Categories Summary

Category	Description
measure	N = headcount FFTE = Fiscal Full-Time Equivalent BIU = Basic Income Unit
t	Term [1 = summer; 2 = fall; 3 = winter]
unit	GRAD or UGRD
faculty	Arts & Science
campus	St. George for all graduate programs except MBT MESC
dom_intl	DOMESTIC or INTERNATIONAL
ftptrgst	FT or PT
yrlvl	Year of study
degree_type_aggregate	Doctoral Program, Masters Program, Prof Masters
sector	Arts, Commerce, Humanities, Science, Social Science (based on MTCU forpos)
department	35+ graduate departments, 7 undergrad pseudo departments (tuition groups)
degree_type	Doctoral, Masters Program, all Prof Masters separate incl. Creative Writing
feecatx	ELIGIBLE or INELIGIBLE; for Ontario funding
hl_fee	HIGH FEE or LOW FEE
new	New intake [0 = no; 1 = yes]
campus_incidental	Associated Organization in the student information system (ROSI)
funded_cohort	Y or N; based on rules & historical data for the faculty
regtype	Current Registration Status (REG, INVIT, CANC, FINCA)

## (1c) Data Field Summary

The data is arranged in a row called an array as follows:

[ **a** ] Actual = a1 to a20

[ **t** ] Target = t1 to t20

[ **bf** ] Before Finca = bf1 to bf20

[ **af** ] After Finca = af1 to af20

(a1) corresponds to 2000-01

(a2) corresponds to 2001-02

.....

(a20) corresponds to 2019-20

## (2) More Measures

Measure	Description
N	3-term Head Count
FALL_N_FT	Fall FT Count
FALL_N_PT	Fall PT Count
FFFTE	Fall FFTE
NAVG	3-term Tuition unit (Avg F/W Headcount if program fee; FFTE otherwise)
FFTE	3-term FFTE
EFFTE	3-term Eligible FFTE
BIU	3-term BIU
BOI_VAL	Basic Operating Income (BOI) = (BIU x 5,110 MTCU BIU Value)
BOI_EFF	Basic Operating Income (BOI) = (BIU x Effective BIU)
FFEE	Subtract Formula Fee (FFTE x Ministry Formula Fee 1,198 Grad 2,386 Ugrd)
GRANT_VAL	Basic Operating Grant using MTCU BIU Value
GRANT_EFF	Basic Operating Grant using Effective BIU
<b>TU_GROSS</b>	Gross Tuition
TU_UNCOLL	Subtract Uncollected Fees Provision
TU_COLL	Add Collection of Fees in Arrears
TU_DOC5	Subtract Doc 5 Adj
TUITION	Tuition before UWC
TOTAL_VAL	GRANT_VAL + TUITION
TOTAL_EFF	GRANT_EFF + TUITION

UGRD Tuition  
Table Final

GRAD Tuition  
Table Final

### (3) Output

Final  
Cube  
[ a, t, bf, af ]

30

## **Conclusion**

The demands placed on divisions as a result of the new budget model forced FAS to become responsible for its divisional revenue generated, and link activities to the revenue generated. Prior to the new budget model, activities were not necessarily linked to revenue generation. The tools at the time were not adequate, and there was no need to project revenue prior to the new budget model. Spreadsheets were ruled out as a solution to the problem early on due to their cumbersome nature from past experiences with them. An automated solution in SPSS, eliminating human error on the part of the model was chosen to serve the needs of FAS.

## **2. Budget Models at the University of Toronto**

### **Introduction**

The University of Toronto was founded in 1827, and is Canada's largest university. U of T offers programs in 17 academic divisions located on three campuses and nine teaching hospitals (University of Toronto, 2008 1). The University of Toronto is committed to being an internationally significant research university, with undergraduate, graduate and professional programs of excellent quality (University of Toronto, 2008 3).

The availability of clear information on revenue and expenditures is essential for the university and its divisions, and is an integral part of any budget process. It is a primary tool in the management of the university and in enabling it to fulfill its mission and achieve its academic goals. In Ontario, universities are responsible for allocating resources to their own functional areas, as the planning on the part of government stops at the institutional level. There are two purposes of the budget process. The first is to support informed decision making by providing information on revenues and expenses associated with various activities and new initiatives (University of Toronto, 2006 1). For example, if FAS wants to increase full-time domestic undergraduate enrolment by 300 students, the budget model would calculate the revenue implication of such a change. The second is to provide mechanisms that enable academic leadership to make budget allocations in accordance with priorities. For example, a "University Fund" is set aside for academic priorities to which divisions submit individual plans for approval. The university's budget model is the mechanism by which operating grants from the

government are allocated to various divisions. The budget model provides a link between divisional budgets, the revenues divisions generate, and the central expenses they incur (University of Toronto, 2006 1).

A task force was created in 2004 to review the way in which funding was allocated to divisions. The main objective of the task force was to examine alternative methodologies, and recommend changes to maximize benefit to the institution (University of Toronto, 2008 4). The task force assessed approaches to budgeting that would increase the transparency of budget allocations, provide incentives to increase revenues, control costs, and ensure the most optimal alignment between revenues and academic priorities (University of Toronto, 2006 1 p. 2). A budget process should provide information on the revenues and expenditures associated with various activities and the financial implications of new initiatives, for the purpose of supporting informed decisions. A budget process should also be flexible enough to enable the academic leadership to make allocations in accordance with academic priorities (University of Toronto, 2006 1 p. 2).

The purpose of this chapter is to discuss various forms of budgets and budgeting in universities, the form of budgeting U of T is typical of, and the problems it encounters. The old and new budget models at U of T are described, along with the challenges faced by FAS in 2006 that would have justified the creation of an enrolment projection system. The division was faced with adapting to a new budget model.

## **Forms of Budgets at Universities**

There are several different forms of budgets in universities. The first is line-item budgeting, where all expenditures and proposals for new expenditures are listed and controlled by specific categories (for example, telephone, faculty salaries, admin salaries, etc.). The second is performance budgeting, where generic expenditure categories are derived in terms of priorities. For example, if new building is needed to house the arts and sciences, a university may consider this a high priority. The third is program budgeting, where budgets are established for broad program areas in terms of priorities and their objectives. For example, a budget for the economics program could include teaching expenditures for those departments that are providing service teaching (for example, commerce, computer science, mathematics, etc.). The fourth is zero-base budgeting, where budgets for certain programs are re-constructed in terms of targets. If the targets are not met, a portion of the budget may be taken away. The fifth is incremental budgeting, where changes are considered only at the margins, largely determined by a small number of factors (for example, government funding or enrolment). The sixth is formulaic budgeting, by which certain commitments are systematically pre-determined by formal convention. For example, central costs at a university could be calculated to be a certain percentage of grant and tuition revenue. Percentages could be recalibrated every few months.

The final form of budgeting is responsibility center budgeting / responsibility center management (RCB/RCM). The basic principles of RCB/RCM are as follows. The first principle is that all costs and income generated by an academic unit (division or department) are attributed to that unit, appear in its budget, and are under its control. The

second principle is that each academic unit now has an incentive, to increase income and reduce costs according to its own priorities. The third principle is that decisions about prices (tuition fees) and volume (enrolment) are delegated to academic units. The fourth principle is that line item budgets are relaxed or eliminated allowing each academic unit to allocate the global revenue base available to it. RCM/RCM is widely used in some of the larger U.S. universities in Michigan, Minnesota, Indiana, New York, and Ohio (University of Toronto, 2006 1 p. 5).

The use of RCB/RCM has a number of disadvantages. The first is that the institution might not have enough knowledge of costs and cost drivers. A second disadvantage of RCB/RCM is that data must be reliable, accurate, and financial systems must be able to give early warning signs of poor management at the divisional level. Implementing RCB/RCM at the same time as a new student or financial system can disrupt the monitoring aspect. A third disadvantage is that it may demand more local managerial skills and appetites than actually exist. RCB/RCM may require an individual or group of individuals with more advanced computer skills to be able to create monitoring reports. A fourth disadvantage is that there may be asymmetry between government funding formulas and actual institutional cost structures. Funding formulas are based on averages that treat all programs in certain categories the same. A fifth disadvantage is that service teaching and RCB/RCM are not always compatible because departments are unwilling to share their resources. Policies are needed to ensure sharing of resources occurs, and is reasonable for all of the parties involved. In the absence of such policies, departments may be unwilling to offer interdisciplinary studies (for example, an undergraduate economics and computer science program).

## **U of T Budget Model – Before 2006-07**

The expense budget of each division consisted of two types of allocations, base and one-time-only (OTO). The base component consisted of recurring expenditures, and was adjusted each year for salary increases, progression-through-the-ranks (PTR), and allocations made by the provost for items such as new hires. The OTO component was made up of non-recurring expenditures such as the purchase of computer equipment. The base concept meant that funds previously allocated to a division remained with that division in subsequent years. An advantage of this was to provide divisions with a stable budget to facilitate planning. However, when expenses increased more rapidly than revenues, budget reductions were introduced to balance the budget (University of Toronto, 2006 1 p. 3). Several initiatives were introduced since the early 1990s to increase flexibility, and to make budget allocations more responsive to changing academic and provincial priorities. The first was an Academic Priorities Fund (APF), which was established by applying an across-the-board budget reduction of 1.5 percent to all divisions. The fund was then allocated to divisions cyclically based on their five-year academic planning process. The second was the Enrolment Growth Fund (EGF), which arose out of provincial priorities such as the Access to Opportunities Program (ATOP) to help increase enrolment in computer science and engineering programs, and provide those students with leading-edge technology as learning tools. Divisions who could participate in ATOP were given incremental budget increases based on enrolment growth in the ATOP programs (COU, 2000 p. 3). The third initiative was for self-funded programs that did not receive funding from the Government. A division offering such a program retained all revenues, and was charged for central expenses such as central

administration, security, etc. Finally, special arrangements were also been established. For example, the graduate business school has been funded based on Responsibility Centered Management (RCM) since 2002-03, but only for incremental revenue and expense. The OISE budget was based on a 10-year arrangement that arose out of the merger with the University of Toronto in 1995. The Scarborough campus (UTSC) experimented with RCM for a few years, but returned to the general university process (University of Toronto, 2006 1 p. 4).

The task force found several disadvantages with the current system. The first was lack of transparency, where it was not possible to determine how a budget of a division was arrived at by examining either the revenues or expenses of that division. The second was a lack of incentives to increase revenue or decrease expenditures. The third was complexity, where it became too difficult and costly to manage the many different arrangements for revenue sharing under the EGF and keep track of the details. The fourth had to do with changes in provincial priorities, and funding cuts such as the end of the ATOP program. For example, it would be too difficult to fund EGF initiatives without the ATOP funding from the provincial Government. Finally, the multiplicity of arrangements under EGF made it difficult for divisions to plan. Divisions were unable to assess the impact on their budgets resulting from reducing enrolment or changing the domestic/international enrolment mix (University of Toronto, 2006 1 p. 5).

## **U of T Budget Model – Alternative Approaches**

### **RCB/RCM**

When the Scarborough campus of the university (UTSC) was planned in the 1960s, there was a deliberate expectation that it would not be a clone of other programs in FAS at the downtown campus. RCB/RCM seemed to be a means of differentiating the campus from the rest of the university (Lang, Priest et. al., 2002, p. 119).

In the late 1990s, an RCB/RCM pilot project was set up at the Scarborough campus with the following phases. The first was full attrition of revenue, direct costs, and indirect costs. The second was the assignment of central overhead (for example, central human resources, finance, etc.) to budgets. The third was the assignment of non-academic costs to divisions, such as Principal's office costs. The fourth was the attribution of revenue to the academic divisions (Lang, Priest et. al, 2002, p. 120-121).

The pilot project had the following outcomes. The first was that UTSC did not differentiate programs, but rather grew as a means of capturing revenue. The second was that it was unsuccessful in breaking even and generating revenue. The government offered additional funding at the time to grow in certain program areas that were already expensive to run. The BIU weights did not reflect the actual costs of running these programs. UTSC expanded in these areas, and was more focused on maximizing revenue than optimizing net revenue (Lang, Priest et. al., 2002, p. 124-125). For example, enrolment growth can result in costs incurred for hiring faculty, and paying salary increases in the future. Finally, the third outcome was a complication due to implementing a new financial system at the same time as the participation in the pilot

project. RCB/RCM requires accurate and timely financial reports to manage it, which were delayed due to the learning curve involved in the new system (Lang, Priest et. al., 2002, p. 124-125).

The funding environment that the University of Toronto exists in is regulated by the government, and most of the funding comes from tuition fees and BIU revenue, where the BIU is the basic income unit of a system of weights used by the provincial government to determine per-student funding for different programs. In the case of the University of Toronto, three drawbacks to RCB/RCM were identified. The first was that funding considerations would drive decisions more than academic vision. This takes some autonomy away from academic leaders, which they could see as a drawback, but it promotes fiscal responsibility and limits the vision to fitting within one's financial means, which would not be a drawback to the taxpayer. The second was that current levels of government funding have not changed in years, and do not reflect realities. For example, BIU weights have not been changed since the 1970's and may not reflect current costs institutions face in various programs. The third was that constraints on tuition fee increases imposed by the government do not reflect the actual cost of running certain programs.

## **Internal BIU weights**

Another approach considered, but rejected by the task force involved developing internal BIU weights based on program costs. Given that program costs vary widely at the University of Toronto, the exercise was deemed to be too difficult and potentially controversial (University of Toronto, 2006 1 p. 6). Internal BIU weights are a way of getting away from system-wide aggregates.

The task force recommended the Academic Drivers Budget Model (ADBM), which is essentially a version of RCB/RCM where divisions have the freedom to generate revenue, but a portion is set-aside for university-wide initiatives. The development of the model also took into consideration the university's academic planning process, the nature of the provincial funding formula, the variation in tuition fees, and the decentralized nature of the university (University of Toronto, 2006 1 p. 8). In addition, divisions became responsible for salaries, benefits, and salary increases.

## **U of T Budget Model – After 2006-07**

The ADBM model is described in the following three steps, where gross revenue is defined to be the total revenue attributed to a division from all sources. The first step involves allocating a portion of the gross revenue to the university-wide costs (UWC), University Fund (UF), and student aid. The recent allocation shares of revenue are as follows: UWC 25 percent of gross revenue, UF 10 percent of gross revenue, student aid 10 percent of gross tuition revenue. The UF is allocated based on the university's multi-year academic plans and priorities approved by Governing Council. The fund was created to ensure the viability and stability of academic programs, as well as fund university-wide initiatives. The cost bins associated with the university-wide costs are described below with an indication as to the relative size.

**TABLE 3: Breakdown of the University Wide Costs by Cost Bin**

Bin	% share	Name	Basis for Cost Attribution
1	24%	Occupancy Costs	total space used, measured in Net Assignable Square Meter (NASM)
2	4%	Information Technology	gross revenue, faculty & administrative staff FFTE, Undergraduate & graduate FFTE
3	3 %	University Management	gross revenue
4	2 %	Financial Management	gross revenue
5	4%	Human Resources	faculty & administrative staff FFTE
6	9%	Pension Amortization	appointed salaries
7	6%	University Advancement	degrees awarded, 10-year rolling average of total funds raised
8	20 %	Library	undergraduate & graduate FFTE, faculty FFTE, Research revenue
9	2 %	Research Administration	3-year rolling average of total research revenue
10	4 %	Student Recruitment & Registrarial Services	undergraduate & graduate FFTE
11	12 %	University Wide Academic Expense	gross revenue
12	10 %	University Wide General Expense	gross revenue

*Source: University of Toronto, 2006 1 p. 28-29; University of Toronto, 2006 2 p. 22*

The second step involves adjusting the net revenue for inter-divisional teaching and other inter-divisional activities. The task force identified three types of inter-divisional teaching as follows. Category A consists of students taking a course offered by another division intended for its own students. The task force recommended that revenue sharing be on a per-full-course equivalent (FCE) basis, and the per-FCE value be determined using appropriate parameters for the course in question. The task force recommended the teaching division receive 5 percent profit/loss sharing with a Category A course. Category B is where a division offers a course specifically in another division. The task force recommended that the teaching division receive a 20 percent share of the resulting notional profit or loss associated with a category B course. The teaching

division is assumed to take responsibility for the course it offers and will be involved, as appropriate, in the development of the course syllabus and how it fits the students' academic program. Category C is for joint programs, where profit and loss are shared 50/50 (University of Toronto, 2008 2 p. 10-11). The handling of inter-divisional teaching is a clear example of how the new budget model is not pure RCM as indicated in the first principle.

The third step involves allocating the University Fund back to divisions according to the university's multi-year academic plans and priorities. Each division prepares a multi-year budget plan at the beginning of the planning cycle to inform the provost with an understanding of the financial position of the division along with special circumstances it may face (University of Toronto, 2006 1 p. 9).

## **Methodology of the University Wide Budget Model**

The overall budget model consists of three sub-models (revenue model, cost model, and student aid model). The undergraduate and graduate enrolment models produce data that are used as inputs to the three sub-models. The enrolment models use historical enrolment headcount data to forecast year-over-year student retention rates for fall, student flow through rates for fall, summer over previous fall rates and winter over fall rates for the purpose of estimating winter and summer headcount. The undergraduate model is stepped down to a level of detail consisting of full-time/part-time, domestic or international legal status, year of study, high/low tuition fee, BIU eligibility, and degree type (for example, bachelor, special).

The graduate model is stepped down to a level of detail consisting of full-time/part-time, domestic or international legal status, year of study, high/low tuition fee, BIU eligibility, and degree type (for example, masters, professional masters, doctoral). The latest fall actual enrolments in year (t) are flowed through to fall (t + 1). Intake targets for fall (t + 1) are inserted, and the winter and summer terms are calculated. The projections in (t + 1) are then flowed through followed by the insertion of intake targets to obtain (t + 2), and so on. The graduate headcounts are then converted into FFTEs (1 full-time head = 1 FFTE; 1 part-time head = 0.3 FFTE).

The undergraduate headcounts are converted into FFTEs using average FFTEs. Undergraduate FFTEs are calculated by dividing the FCE (full-course equivalent) by the full-course load. Since the full-course load is typically the full load spanning fall and winter, fall FFTEs are divided by 2. The FFTEs in both enrolment models are converted

to BIUs using average BIU weights stepped down to the level of detail described above. The headcounts, FFTEs, BIUs become drivers in the three sub-models.

The cost model determines the university-wide cost UWC for each division based on the average usage of services from the other academic and administrative divisions. For example, central finance uses services from physical plant, but not services from FAS. FAS uses services from both central finance and physical plant. In FAS, the UWC is approx. 35 percent. In addition to central costs, FAS must pay for their own divisional finance, human resources, advancement, registrar, and office of the Dean.

The revenue model calculates the gross revenue broken down by category for each division (provincial grant revenue, tuition revenue, investment income, other income, provincial scholarship grants, endowment revenue, Canada Research Chairs, and overhead revenue). Net revenue is obtained by applying deductions for the UWC, UF, and student aid from gross revenue.

The student aid model distributes various types of student aid to divisions based on the tuition and grant revenue distribution for centrally housed student aid (for example, student aid held in the school of graduate studies) where no breakdown exists by division. Where a breakdown exists, the student aid is allocated to the respective division directly.

### **Implications on Revenue Projections at the Divisional Level**

In terms of the budget, the only items that can be projected by FAS are the gross grant and tuition revenue. The other categories, for example, involve the use of enrolment and financial data from other divisions of which FAS does not have

jurisdiction. The same holds true for the UWC, as FAS would need to know information about costs in non-academic divisions they use services from such as central human resources, as well as grant and tuition revenue from other divisions.

In terms of the grant, the effective BIU value is a notional BIU value that takes into account all operating grants coming to the university from the government. The effective BIU value is the university-wide sum of the basic operating grant, other operating formula grants, and non-operating formula driven funds divided by the sum of the BIU total for the university. The FAS model calculates the grant using the BIU value as well as the effective BIU value in place of the BIU value. The effective BIU value is exogenous to the model since a division does not have jurisdiction over making enrolment projections in other divisions for the purpose of calculating the other operating formula grants. In addition, it is not possible at the divisional level to be able to anticipate how much non-operating formula driven funds will be allocated to the university from the government. The university-wide budget model uses the effective BIU value in place of the BIU value for the purpose of calculating total divisional government grants. The standard fee value and BIU weights are exogenous to the model, which in turn means that only the difference between the standard fee and the actual fee is actually within the model, not the whole actual fee.

The enrolment projection part of the FAS model is independent of the university-wide budget model. The FAS model steps the data down further to the departmental and degree type level, and therefore calculates its own factors at a further level of detail.

### **3. Research Problem**

#### **Ontario Government Graduate Expansion Program**

In 1995, secondary education in the province was reformed to modernize the system and save money. The reform involved removing the grade 13 year (known later as the Ontario Academic Credit year) after grade 12 and re-designing grades 9-12. This change created a double cohort in which graduates from the new 9-12 program and graduates from the former 9-OAC program entered university in fall 2003. The Ontario government provided additional funding to universities through a special capital fund called “SuperBuild”, and other initiatives in order to accommodate the double cohort. In 2003-04, a task force on competitiveness, productivity, and economic progress found that Canada that Ontario did not produce sufficient graduate students to compete with global competitors. On a per-capita basis, Ontario produced 1.58 Masters degrees compared to 2.19 in the US. For PhD programs, the Ontario figure was 0.13 compared to the US figure of 0.16 (COU, 2008). In addition, the double cohort was expected to enter graduate programs in 2007-08 (COU, 2000). In 2006, the government announced that Ontario would increase eligible graduate spaces by 12,000 over 2002-03 levels (Ontario Government, 2006). BIU Eligibility will be described in detail later in this thesis.

#### **Conditions at FAS**

The Faculty of Arts and Science (FAS) represents over half the student population on the university’s main downtown campus. The division is the core of a three-campus graduate program focusing on doctoral education and research. With 800 faculty

members teaching 2,000 courses arranged in 300 undergraduate, 71 graduate and 35 graduate collaborative programs hosted by 29 departments, 36 interdisciplinary programs, centers and institutes, and seven colleges, along with a dedicated administrative and technical staff of more than 400, the division is the largest in Canada and among the most comprehensive in North America (University of Toronto, 2008 1).

In 2006, FAS like all divisions under RCB/RCM had to take control over their revenues. The division was faced with new budget model as well as the potential to increase its revenue through graduate expansion. Since revenue (grant and tuition) is a function of enrolment, the division needed to be able to predict enrolment in order to determine revenue. Since budgets are allocated at the beginning of a fiscal year based on divisional targets, with an adjustment to actuals later, failure to meet targets after the funds have been spent could produce a deficit that FAS would be responsible for under the new budget model.

The division had access to enrolment projection models that produced aggregate figures at the divisional level, a draft enrolment count produced in October, and a final count produced in November, but finalized in December. These models did not allow the division to project enrolment by department and program. They were also unable to know before the draft count if they were not going to meet targets. Given the academic year begins in September, remedial action was impossible to take in December. On the graduate side, the division had access to a report that kept a count of applications, offers, and confirmations, but did not split out FT and PT students nor take into account students applying to multiple U of T graduate programs (ROSI 1FA report).

The FAS model is a composite of certain aspects of models operating at a macro level above it. However, it projects enrolment (headcount, FFTE, and BIU) independent of the university-wide budget model. The FAS model can only be used to project tuition and operating grant revenue in the divisional budget, as other revenue and cost categories use data that are beyond the jurisdiction of FAS, and have to be taken as given.

## **Stakeholder Interview**

A series of interview questions were provided to some of the key stakeholders in the model for their feedback. The stakeholders interviewed were the FAS Vice-Dean (Research and Graduate Programs), FAS Chief Financial Officer (CFO), the Executive Director of Planning and Budget (referred to as the Director in this section), the former Executive Director of Planning and Budget (referred to as the former Director in this section), and the Vice-Provost of Planning and Budget (referred to as the Vice-Provost in this section). The Vice Dean is responsible for overseeing graduate enrolment projections by department. The CFO is responsible for overseeing divisional revenue projections. The Director is responsible for taking FAS enrolment projections as an input in generating the FAS budget. The Vice-Provost is responsible for the entire university budget.

### *Question 1 – What Were the Objectives of the model from your point of view?*

According to the Vice Dean, the most important objective was to be able to track enrolment changes over time, and relate changes to targets. This allows for issues to be addressed as they develop, with the relevant chairs. For example, by studying the model, chairs can be alerted to the fact they are falling behind on their domestic targets, or

exceeding their international targets. This is an example of the cybernetic control aspect of the model that was described earlier in this thesis. Another objective is to provide divisional and departmental totals of students in various programs (doctoral, masters, and professional masters) by domestic and international.

According to the CFO, the initial objective of the model was to forecast graduate enrolment using targets provided by each of the departments. The immediate need at the time was to estimate those figures for the purpose of determining graduate growth expressed as full-time eligible FTEs. That information was needed to distribute graduate expansion funds to academic units. At the same time, the model was intended to forecast total gross revenue income from government grant and tuition.

According to the Director, the main objective of the model was to give FAS control over decision making, without having to rely on P&B. FAS could generate reports in a more-timely manner, and had better knowledge of their local data. The model is sustainable, and can handle a large volume of data, and many levels of detail. According to the former Director, an enrolment model should work as a centralized source of the enrolment information both past, present, and future. The most important use/application was the forecasting of revenue (tuition and operating grants).

According to the Vice-Provost, the first objective is that the model should be suitable for reporting to the government. The second is that it should provide information for management and planning. Reporting to the government requires accuracy and the ability to conform to strict definitions, which may change from time to time. For example, funding for graduate expansion in Ontario uses a different definition for FTE than that used for undergraduate expansion. Support for planning, on the other hand,

requires a high degree of flexibility to generate scenarios quickly. Great accuracy is not required.

*Question 2 – What scenarios do you think the model should be able to forecast?*

According to the Vice Dean, it would be useful to forecast changes to revenue under various BIU rate scenarios. This is currently done now by assuming a certain percentage of students who are BIU-eligible. The Vice Dean wondered if we could get more useful information if we modeled income based on actual BIU status per student. For example, a new category called “PARTIAL” could be defined in addition to “ELIGIBLE and “INELIGIBLE” to model students who attract partial BIU in a given year. He also felt it would be useful to see a breakdown by year of study of the students in the projections. For example, imagine two departments with 100 students each, and both are meeting their targets for domestic and international students. The current reports may show the two departments to be identical, but in reality, one may be heavily weighted towards new doctoral students, meaning they should accept relatively few over the next few years, while the other may have most students in year 5, meaning they should accept more students than the other department. Some chairs struggle with this “total enrollment” vs. “intake”, and it would be helpful to show the detailed data to them from the model. The model is capable of producing a report that breaks down revenue projections by year level to illustrate the distribution of enrolment and revenue to those years. This data could be linked to cost data, thus linking planning and budgeting.

According to the CFO, the most obvious scenarios relate to forecasting multi-year revenue generation. These scenarios use different assumptions about tuition increases for domestic and international students. These scenarios also use different enrolment mix

assumptions. As demonstrated in the recent move to program fees, the model is able to factor in different course intensification assumptions. The model is also able to incorporate graduate and undergraduate units or programs to which special tuition applies (commerce, computer science, and professional masters programs).

According to the Director, the model was very responsive in providing decision support on the implementation of program fees, as well as the parameters of the program fee structure (intensification, threshold, and grand-parenting). The model is also able to inform the revenue impacts of various undergraduate and graduate enrolment decisions. It could be used to look at initiatives that impact retention rates, such as a comparison of International students in the International Foundations Program (IFP) versus International students not in the program. The model could be used to track time to completion on the graduate side, as that could influence BIU funding if chairs knew their students were not BIU-Eligible. Measures could be put in such as a time to completion guidelines.

According to the former Director, the model should forecast changes in price (tuition, BIU value), changes in volume (different enrolment levels), changes in discipline mix, and changes in degree level mix.

According to the Vice-Provost, the model should accommodate two types of projection. Given a pattern of admissions, it should generate projections for total enrolments and the associated government grant and tuition revenue over a period of at least five years. Conversely, given a total enrolment target a few years in the future, the model should be able to suggest admissions targets that would lead to the desired target. The user may wish to test the effect of changes in demographics, size of the applicant

pool or program delivery, which may affect attrition rates, student promotion, admissions yield, and so on.

*Question 3 – Where is FAS going with the model? Where is the U of T going with it?*

According to the Vice Dean, he would like to see FAS attempt to tie in the information from the enrolment model to the per-student-budget that has been worked on in the past. The per-student-budget is an attempt to see whether FAS graduate studies revenue covers costs as a whole and by type of student. The per-student-budget takes all of the combinations of different types of graduate students (department, full-time/part-time status, Domestic/International, degree type, funded/unfunded cohort, BIU Eligible/Ineligible, and year of study) and calculates the revenue that each type of student generates, and the cost associated with those students, followed by the net revenue. The gross revenue by type of graduate student is pulled from the model and inserted in the per student budget. The per-student-budget illustrates which types of students are more cost-effective to admit.

According to the CFO, FAS considers the model to be a dynamic tool that should adapt to changing circumstances. For example, it was first designed to take total enrolment targets as an input, but was recently modified to take new intake as an input for undergraduate bachelor degree programs. This change was made by the Vice-Provost who wanted FAS to submit undergraduate intakes rather than totals going forward. Part of the problem in submitting totals is that intakes can spike if there are significant differences in the totals from one year to the next. Spikes in new intake can have negative financial impacts on institutions. For example, suppose there are 1,000

undergraduate students this year evenly distributed in an undergraduate program with a flow-through rate of 80 percent from year to year. If next year's target is 800 students, new intake would drop by 50 students. In Ontario, in the absence of mandatory retirement, the university may have to continue paying the tenured complement forever if nobody retires. If the revenue generated by the 1,000 students is able to sustain the faculty complement, a drop to 800 may not, resulting in a deficit. The U of T 2030 plan had FAS decreasing in undergraduate total enrolment in the long term. However, the planned decline over the next five years was greater than the decline in Faculty costs due to lack of retirements, prompting a request to hold new intakes constant for a few years.

FAS will be exploring the possibility of having the model forecast revenue by undergraduate program, which is a challenging task, given the current structure of programs with multiple combinations of majors and minors. If a student is pursuing a double major in X and Y, the challenge is to develop a methodology that assigns them to department X or Y, possibly by counting courses taken in a given term.

With the passage of time, the model will have more and more data points within it, and FAS can envisage that the university may adopt all, or part of the model to apply to the rest of the institution to take advantage of the automated nature of it, and move away from spreadsheets.

According to the Director, P&B hopes that they and FAS are not going in different directions, continuing to communicate, and work together. The former Director was not able to comment.

According to the Vice-Provost, some areas of application include the following. The first is that projected revenues are essential for decision making, both at the

university and at the divisional level. The second is that scenarios can be very helpful in supporting government advocacy. The third is that projected revenues from the model are essential in the preparation of the university's overall budget. They are also needed for making budgetary allocations to divisions under the University's current budget model. The fourth is that some divisions may use the model for revenue sharing under interdivisional teaching agreements. This requires detailed information about student enrolment in courses and instructor appointments.

*Question 4 – Is there any need to modify the model in the future?*

According to the Vice Dean and CFO, there is no doubt that the model will have to adapt to the changes that may arise due to changing regulations from government and the institution itself. An example of a past change is the implementation of program fees. An example of a future change might be to charge differential tuition fees, where arts students pay a lower fee and science students pay a higher fee. According to the Director and former Director, this question is local to FAS. However, more user friendly reporting could be explored, such as a web-based interface. The current SPSS outputs are limited in terms of the insertion of notes. If the user wanted a note in the middle of the report, the report would need to be copied from its SPSS output and pasted in Microsoft Excel where the note could be inserted. A web based interface would allow a user to design a custom report, insert their own notes, and save it to a desired format such as Microsoft Excel or PDF.

According to the Vice-Provost, the enrolment model should be integrated with the university's budget model. It may be possible to include some space and cost elements in

the projections. It is also desirable that a simplified version of the model be available for divisional staff to use in their own enrolment and budget planning. Some divisions need this information at the departmental level.

*Question 5 – Can and should the model be used as part of a calculation of net cost per student by program?*

According to the Vice Dean, the gross revenue from the model is inserted into the per-student-budget to see whether admitting different kinds of students makes a difference in terms of net revenue to FAS. According to the CFO, it should be used for that purpose. However, this may require a review and modification of the current student information system (ROSI), so that specific student aid data is easily retrievable per student. Due to privacy laws, OSAP may not be able to release data that identifies students. However, the unmet student aid is provided to the university in the form of a report that shows the average unmet need by program area. This could be built into the model as a deduction on the tuition side, analogous to the standard fee deduction on the grant side. According to the Director, it would be a good capability to develop.

Overall, the feedback from the interview demonstrates that there are different data needs and expectations of the model. For example, a Vice Dean may be interested in enrolment projections at the departmental and degree type level while the CFO may only be concerned with the divisional level. A Director in P&B may only have experience with a specific application of the model such as program fees. The model was created with this in mind, allowing for layers of detail to be aggregated or disaggregated for reporting purposes. The modules within the model can be re-designed to meet future

needs, such as the possible implementation of program fees for part-time students (e.g. students taking fewer than three FCE are charged a single fee).

The model produces a single cube that forms the underlying data for the generation of many different reports. Some of the standard reports were discussed in this thesis, such as the monitoring report for graduate students and other revenue reports. Other reports are by-products of the model, and are generated through data requests. For example, the FAS Infrastructure Planning Office requests a report showing fall full-time and part-time graduate student headcounts by department for the purpose of determining how much graduate office space to allocate. This report is simply a query on the cube produced by the model. The report would be created, provided, and then stored for future reference. According to the former Director, a model that is dedicated to the revenue side is most useful. Separate calculations/models for the cost side, makes more sense.

According to the Vice-Provost, this is not an easy number to calculate, except possibly for large, self-standing programs such as those in Engineering. Great care must be exercised in defining what is included in the cost of a program, and how shared costs are attributed. The way costs are attributed in the university's budget model is intended for budgetary purposes only. It is not an exact assessment. In many cases, it is neither possible nor desirable to carry the RCM concepts to the program level, because of the high degree of sharing of resources. Also, it is important to ensure a proper balance between academic and financial considerations.

Overall, the questions above show some of the very different perspectives and demands placed on the model. Step four of the planning cycle described earlier indicated that the model must link budgets and priorities of different groups within the university.

The model addresses these problems simultaneously, and solves Mintzberg's problem of aggregation and timing. Overall, the model closes the planning cycle loop described earlier.

### **3. Existing Enrolment Models**

#### **Introduction**

The main purpose of student enrolment projection models is to predict tuition and grant revenue, and to allocate resources to academic departments (Hopkins & Massy, 1981, p. 352). Enrolment projections are made at various levels, such as institutional, divisional, departmental, and by degree type. Certain historical information about enrolment patterns is needed, as well as current information about political issues and economic trends (Kraetsch, 1980 p. 1). The purpose of this chapter is to describe general enrolment projection techniques; present three methodologies; present an existing automated model; situate the FAS model within the existing methods; and describe how it can be expanded to serve other institutions.

#### **Enrolment Projection Techniques**

Enrolment projection techniques vary depending on four main factors. The first is the use of the prediction (e.g. planning, budgetary purposes, or a combination of both). A projection that is used for several purposes may be more complex. The second is the level of the projections (e.g. state or institutional), and the third is the expertise of the researchers (e.g. some researchers may have limited knowledge of spreadsheet software). The fourth is the quality of the data available (e.g. the student administration system may not record certain data such as the instructor who teaches a particular course) (Kraetsch, 1980 p. 1). The fourth factor is consistent with Mintzberg's findings in terms of the lack of accuracy and timeliness of data for planning.

In general, curve-fitting and causal models are the types of quantitative models used for enrolment projections. The curve-fitting approach generally assumes that past trends will continue to impact future enrolment patterns. Some examples of curve-fitting include simple averages, moving averages, exponential smoothing, polynomial models, exponential models, and spectral analysis. The causal models approach accounts for the fact that curve-fitting may not take into account certain demographic variables such as fertility rates or number of high school graduates. These variables could impact historical trends; for example, if high school graduates' performance continues to improve, the retention rate from first-year university to second may rise, and not be similar to historical retention rates. The most common causal models are ratio methods, the Markov Chain Method, and cohort-survival techniques, which also rely on historical enrolment data (Kraetsch, 1980 p. 2-3).

### **Three Methodologies**

#### **Grade Progression Ratio (GPR) Method**

The grade progression ratio method  $a_{j-1,j} = N_j(t) / N_{j-1}(t - 1)$  is the ratio of students in one year level at time "t" to students in the immediate lower year level at time "t - 1". Given a set of ratios for  $j = 1, 2, \text{ etc.}$ , and starting enrolment by year level  $N_j(0)$ , future years are predicted by the following equations:

$$N_1(t) = f(t)$$

$$N_j(t) = a_{j-1,j} N_{j-1}(t - 1) \text{ where } j = 2, 3, 4$$

This model assumes students move between one time period and the next, either advancing to the next year level, or leaving the system completely. It is suitable only for

making year-over-year predictions of enrolment. The difficulty of this approach is the inability of semester-to-semester enrolment projections as well as the fact that students in reality can repeat a year, or drop out temporarily, and return in the future. Since this aspect is not captured in the GPR model, it is prone to large errors (Hopkins & Massy, 1981, p. 353-354). For example, this model would not account for students to drop out and come back later, and could ultimately understate tuition and government grant revenue. This model is un-realistic because students are allowed to drop out for a term or more, and come back at a later date.

### **Markov Chain Method**

The Markov Chain method can overcome the potential for errors in the last model by incorporating the flow-through of students who remain at the same year level in consecutive time periods.  $p_{ij}$  refers to the fraction of students in year “i” in one period that can be found in year “j” in the subsequent one. The following system of equations is used for projections. The model can also be modified to handle new transfer students and multiple terms.

$$N_1(t) = p_{11}N_1(t - 1) + f(t)$$

$$N_2(t) = p_{12}N_1(t - 1) + p_{22}N_2(t - 1)$$

$$N_3(t) = p_{23}N_2(t - 1) + p_{33}N_3(t - 1)$$

$$N_4(t) = p_{34}N_3(t - 1) + p_{44}N_4(t - 1)$$

The advantage of using the Markov method in constructing the model is that it can provide estimates of attrition between terms, and that estimates of enrolment for the fall term will be more accurate because they have been based on enrolments in the

previous spring. The disadvantages of using Markov Chains are that more data are needed, the data are not as readily available as for the GPR, and enrolment statistics rarely distinguish between old students according to their previous year level (Hopkins & Massy, 1981, p. 354-355). To address this deficiency, the Markov method can be modified to add a fifth “vacation” state for stop-outs (Hopkins & Massy, 1981, p. 356).

### **Cohort Flow-through Method**

The main difference between the cohort flow-through method and the methods presented earlier is that the cohort flow-through method takes into account students’ origin as first-year, transfers, and the accumulated duration of their stay at the university (Hopkins & Massy, 1981, p. 356). This method is a special case of the Markov Chain method in which the model was expanded to include the origin of students and their length of stay (Hopkins & Massy, 1981, p. 359). Suppose there are  $K$  types of cohorts that enter in each time period labeled  $k = 1, 2, \dots, K$ .  $P^k_j(s)$  is the fraction of students in cohorts of type  $k$  who are enrolled in year level “ $j$ ”, “ $s$ ” periods after entry. New student flows  $f(t)$  are separated into cohorts and are designated by  $f^k(t)$ .

The total enrolment of students in year level “ $j$ ” at a particular point in time “ $t$ ” is predicted by combining the contribution of all past cohorts of type “ $k$ ”:

$$N^k_j(t) = P^k_j(0)f^k(t) + P^k_j(1)f^k(t-1) + P^k_j(2)f^k(t-2) + \dots = \sum_{s=0}^T P^k_j(s)f^k(t-s)$$

$T$  = maximum number of periods after entry that a student could still be enrolled.

Summing these numbers over cohort types gives the total enrolment at level “ $j$ ” is

$$\sum_{k=1}^K N^k_j(t).$$

## **Reliability Testing of the Methods**

Robert M. Oliver compared the GPR and Markov methods from historical student records at the Berkeley campus of the University of California in the early 1960s. His results did not favour one model over the other (Oliver, 1968). The predictive capabilities of a four year and five year model (four + a vacation state for stop-outs) were examined by Marshall, Oliver, and Suslow in 1970. Each model incorporated data based on actual student flow-through that occurred at Berkeley between fall 1960 and fall 1961. The authors concluded that the five year level model was consistently better than the other two (Marshall, Oliver, and Suslow, 1970).

Oliver and his colleagues also found the cohort flow-through method to be the most stable (Hopkins & Massy, 1981, p. 360). A cohort flow-through model at Stanford with historical data going back to fall 1967 was tested in 1972-73. The cohort model yielded an error rate of less than 1 percent due mostly to the fact that there were five cohorts of historical data in place prior to using the model (Hopkins & Massy, 1981, p. 363).

## **An Existing Automated Model**

Dr. William F. Massy is currently a Professor Emeritus of Education and Business Administration at Stanford University as well as President of The Jackson Hole Higher Education Group, Inc. After 1988, he began to develop a full-scale computer simulation of university behaviour called Virtual U that was released by the Alfred P. Sloan Foundation in the fall of 2000. The behaviour focused on institutional strategy, faculty roles and responsibilities, resource allocation processes, and universities as systems (Massy, 2001).

Virtual U allows users to set, modify, monitor institutional parameters and policies, allocate resources, and watch the results continually unfold in a simulated environment. It is designed as a Windows compatible CD based video game programmed in C++. The game consists of a graphical user interface with several help screens and tutorials. The data used in the game are derived from an extensive compilation of United States higher education data. Users assume the role of university president, and can choose the type of institution they wish to manage such as public, private, large, small, etc. Users can make decisions or view financial statements with the ability to drill down to the professor level. They can determine policies for resource allocation, divisional goals, or select scenarios that implement the desired goals. The simulation continues while the university is financially viable. The president must also deal with chance events such as a scandal on campus or changes in government funding. Users have the option of turning off the chance events during simulation (Educause, 1999).

Upon starting the game, players choose from a custom, scenario, or express simulation. The scenarios have a specific challenge and offer criteria for which success is evaluated. For example, the new money scenario is judged by the increase in institutional prestige and by the institution's overall performance over a ten-year period. The complete list of scenarios includes the following; balance the budget, pay better, allocate new money, teach better, improve research performance, win games, control tuition increases, limit enrollment shifts, enroll more minority students, hire more minority faculty. The custom setting allows the user to choose their own issues and select up to 15 departments from a list of 38. The two advanced options screens allow the user to make choices about enrolment, enrolment mix, institutional prestige, and financial conditions. For example, a president can choose to focus on attracting more domestic students and fewer international. The express simulations provide a quick start with a generated pre-determined situation (Educause, 1999).

### **The Campus**

Once the scenario is selected, the campus map is static, and provides visual orientation. Six indicators track key data such as enrolment, research, faculty, student morale, and financial performance. The president can gain more information by clicking a building (Educause, 1999).

### **Faculty**

Virtual U simulates each faculty member as an individual, organized by departmental affiliation, gender, ethnicity (majority or minority), and academic rank

(assistant, associate, professor, adjunct). Teaching loads are assigned by departments, and professors allocate their time among class preparation, out-of-class student contact, course development, scholarship, and research. Professors submit research proposals that may or may not generate funding. The president sets policies that govern faculty hiring and salary increase distributions. Through the course of the game, professors can become unhappy, and can choose to retire or leave the institution (Educause, 1999).

## **Students**

Students are simulated similar to faculty, and can be full or part-time undergraduates, distance learners, masters, or doctoral. Student attributes include athletic talent for full-time undergraduates, number of courses accrued for graduation, major department, morale, academic performance, and academic talent rating. The Virtual U Admissions Office extends offers to applicants, manages financial aid, and tracks applications and their yield. The applicant market consists of seven types of students with varying academic and/or extracurricular qualifications. The admissions algorithm generates the number of applications, admissions offers, and graduations for each full-time undergraduate student type. Data from the National Education Longitudinal Study (NELS) are used to determine segment sizes and the impact of institutional attributes on applications and yields. For the other student categories, a simplified algorithm is used. The president sets targets for each category of students except doctoral. Departments admit their own doctoral students whom receive full financial aid. The president also determines the allocation for financial aid. For example, the president can choose to

allocate financial aid to undergraduate full-time students with athletic talent over those with academic talent (Educause, 1999).

## **Courses**

Full-time students are assumed to take four courses each in two terms (fall and spring). Some students select summer as a regular term. Part-time and distance learners take half the normal number of courses. The game uses a probability vector based on empirical enrolment data to assign students with a major at the end of their first-year, while masters and doctoral students enter a department. Undergraduate courses are categorized as depth (number of departmental courses taken before the current course) and focus (whether the course is taken in years 1-2 or years 3-4). Each major has requirements that specify the number of courses needed from each department focus and depth combination. Student progression toward graduation is impacted by denial of entry into courses or failure of a course. Students with lower academic talent fail more courses, and have to repeat them. Departments have a preferred teaching mix in terms of large lectures, breakout sessions, small seminars, and general courses. Actual class size can exceed the ideal at the expense of morale and educational quality. For example, class sizes which are larger than normal result in more students failing courses. In terms of supply and demand for course space, doctoral students have the highest priority while distance learners have the lowest. Demand limits are reached when all students have selected their courses. Supply limits are reached when all faculty members are assigned to their maximum teaching loads or all courses have reached their maximum enrollments.

Users can change enrolment to impact demand and/or faculty to impact supply (Educause, 1999).

## **Finance**

Funding sources include tuition revenue (tuition x student FFTE less financial aid), sponsored research, gifts for current use, endowment, and state funding for public institutions. Uses of funds include departmental expense, direct sponsored research expenditures, libraries, information technology, student life, athletics, fund raising, and administration. The three expenditure categories are faculty salaries, staff salaries, and other (for example, travel). Players can transfer funds to a capital reserve for use by the Facilities Office to build new buildings. Buildings can also be financed from dept. The Development Office reports on fund raising, and the Investment Office reports on endowment return and allows players to invest the endowment in different stocks and bonds with a varying level of risk (Educause, 1999).

## **Resource Allocation**

Revenues and expenditures depend on the growth rates of tuition and financial aid, the endowment spending rate, the research overhead rate, the size of the salary increase pools for faculty and staff, and the transfer to the capital reserve. Players can manipulate the target, the acceptable upper and lower limits, and the priority to be associated with each policy. The optimize button activates a quadratic program that simulates the budget staff's effort to achieve the president's policy targets and limits (Educause, 1999).

## **Presidential Performance**

In the Virtual U game, the president is evaluated once a year in annual performance evaluations. The president receives an ultimate score that he/she may wish to maximize. The main criterion for presidential success is maintaining financial viability. If the president is not maintaining financial viability, the game will issue a warning and remedial action will need to be taken within a period of time. Failure on the president's part to take remedial action terminates the game (Educause, 1999).

## **Comparison with Existing Methodologies and Use at Other Universities**

The model presented in this thesis is a cohort flow-through model that also uses historical data to make future predictions on enrolment. It uses simple averages for compiling factors that do not change over time, and moving averages for factors that do change over time.

The model is similar to Massey's in the following two ways. The first is that it allows for the monitoring of institutional parameters such as enrolment and revenue. The second is that it is capable of instant results, addressing Mintzberg's problem of timeliness and accuracy of data.

The FAS model is different from Massey's in the following ways. The first is that the data in the model are actual count data from FAS, and are calibrated after every term. The data in Massey's model are derived from higher education data in the United States, and would be static, unless updates with new data were installed. The second is that the FAS model is not intended to be a costing tool, allowing for the input of parameters on the cost side such as salaries and benefits. The FAS model operates at a more refined

level of detail, allowing targets to be entered by department and degree type, rather than percentages of enrolment mix desired at an institution as in Massey's model.

The FAS model can be used in different university settings by having the institutions submit data for the six inputs described in this thesis. If the inputs from other universities can be generated the same way they are in FAS, the model will calibrate itself with those factors and model their data. In Ontario, institutions are required to submit student count data (once per term) according to a prescribed template, making it easier to prepare any count for input into the model. The targets would need to be provided in the same Microsoft Excel template used in FAS. In terms of financial cancel and extract data, institutions would need to provide this information from their student administration systems. The course input that is used to determine first-year Commerce for the purpose of maximizing BIUs is FAS specific. This input would need to be ignored for institutions such as Ryerson where students enter Commerce programs in year 1. Finally, the tuition fee inputs could be expanded to encompass other universities.

## **Summary**

Enrolment projection techniques vary by institution depending on the availability of data, the expertise of the researchers, the level they are used at (e.g. state, institutional, divisional), and the use of the projections (e.g. for planning purposes). Causal models tend to build on curve-fitting models to obtain more realistic projections.

The Grade Progression Ratio Method (GPR) predicts fall enrolment from ratios of (a) the number enrolled in a given year level at the beginning of the year to (b) the number enrolled in the previous year level one year earlier. This model does not take

into account the changing mix of new students. The number of parameters is less than 10. The Markov Chain model uses fractional flow-through rates that represent the single period transitions of students from a year level in one time period to the same level or the next year level in the next period. The number of parameters lies between 15 and 50. The Cohort Flow-through Model takes into account survivors from cohorts that entered at various points in the past. The number of parameters may be several hundred. This model is more reliable than the other two. Since students at most universities, including the University of Toronto start their programs in the fall term and only come back in the summer term to repeat courses or fast-track, using the summer to predict the upcoming fall is not realistic.

The simulation game developed by Massey is an example of an automated model that can update itself quickly after receiving instructions from the user. It is based on data collected from institutions in the United States. Data can be supplied to the FAS model from other institutions, and generate institution-specific enrolment projections.

## **4. The Model**

### **Context**

#### **Introduction**

Many jurisdictions in the United States have higher education systems that are planned by the state, resulting in little autonomy for campuses in terms of what types of programs to offer and/or tuition fees to charge. For example, the State University System of New York (SUNY) offers medicine at Stony Brook and the Buffalo campuses only. Other campuses in the system would not be able to offer medicine on their own, unless the government decided it would be offered at an additional campus. In this type of system, institutional research is done by the state, and the state applies formulas that may fund the functional areas of the universities in the system such as teaching, space, and library.

In Ontario, the higher education system is not a system in the same sense as it is in New York State and other U.S. jurisdictions. The universities operate with more autonomy, making decisions on the types of programs they wish to offer. The universities are accountable to the government in the sense that they need to apply and obtain approval to offer new programs. For example, the University of Toronto has a medicine program. If a polytechnic university in Toronto felt there was enough demand for a second program in the Toronto area, they could attempt to establish one and obtain approval from the government, and compete directly with the University of Toronto. Ontario uses a funding formula that does not fund individual functional areas, but rather provides a block grant to the universities. A block grant is a sum of money transferred to

institutions by the government with general provisions as to the way in which it should be spent. This is different than government formulas that fund specific functional areas such as teaching, space, and library. Ontario universities determine through institutional research at the institutional level how to fund their respective functional areas (teaching, space, library, etc).

The purpose of this chapter is to do the following. The first is to describe the difference between formula budgeting and formula funding. The second is to describe the Ontario operating grants formula, and how it has changed over time. The third is to describe other funding mechanisms in Ontario that operate at a system level. Together, this explains the fiscal context of the enrolment projection system.

### **Formula Budgeting and Formula Funding**

Formula budgeting is the use of formulas in developing requests from universities to the government, and then allocating those resources within the higher education system. These formulas may be disaggregated by functional area such as instruction, administration, library, campus police, student services, and physical plant (Stenton 1992, p. 32). Formula budgeting is concerned with issues of equity and adequacy (Stenton 1992, p. 18-20). This type of allocation is more common in centrally planned state education systems in the United States.

Formula funding is the allocation of operating grants to universities and not specifically to functional areas as with formula budgeting (Stenton 1992, p. 18-20). The Ontario government uses a single formula for all operating functional areas making it dissimilar to the U.S. (Stenton 1992, p. 32). Formula funding is concerned with the

equity of inter-university allocations, but not with the adequacy as formula budgeting is (Stenton 1992, p. 18-20). However, in Ontario, formulas have been used to ensure adequacy from time to time, involving special enrolment-driven grants to specific areas of provincial interest such as computer technology in the late 1990s.

Two main advantages of using formula funding are that they promote accessibility in that they are typically linear, implying the more students admitted, the more grant a university will receive. The second advantage is that they minimize conflict caused by lobbying between universities and government (Stenton 1992, p. 28).

The disadvantages of formula funding are as follows. The first is in times of decreasing enrolment, costs do not decline proportionately to the decline in enrolment. For example, the university might not be able to terminate tenured faculty due to an enrolment decrease, and could incur the same cost as if the program were full. However, multi-year averages and corridors, which will be explained later in this chapter, can be used to buffer such impacts to a university (Stenton 1992, p. 29). The second is that formulas could entitle universities to more money from the government through unexpected growth. This is not a disadvantage to institutions, but could be one to taxpayers and result in higher taxes to pay for the growth. The third is that flagship universities in a system may prefer a political approach because they don't want to be treated the same as less prestigious universities in terms of funding. The fourth is that funding formulas are concerned with the allocation of resources, not the adequacy. There is a tendency to expect funding formulas to offset the effects of under-funding, which can not be done (Lang 2005, p. 2-3). For example, if the government significantly decreases funding to the education sector, all programs could become equally under funded.

## **Other Funding Mechanisms that Operate at a System Level**

In general, there are four types of formulas that operate at a system level. The first three are not common in Ontario, while the fourth is. The first are staff-based formulas based on one unit for full-time academic appointments, and can also be weighted by a number of different factors. The second are composite based formulas that are based on separate categories of cost such as research and instruction. For example, research may be funded on the basis of academic complement, masters and doctoral enrolment, while funding for instruction may be dependent on enrolment only (Lang 2005, p. 5-6). They come close to transforming formula funding into formula budgeting, and are found in highly centralized systems (Lang 2005, p. 9). An advantage is that they are accurate in terms of matching funding to university costs. A disadvantage is that they can be complex as they can have several inputs such as enrolment, academic headcount, price indices, space inventory, library collections, research grants (Lang 2005, p. 9). The third type, are marginal cost formulas. These formulas assign various categories of expense, into fixed costs (physical plant) or variable costs (instruction), and assign a particular marginal cost to each expense category. These are most common in systems with a wide variety of universities and in systems with old and new universities (Lang 2005, p. 9). The fourth kind of formulas, are incentive based. These formulas are common in Ontario, and recognize output based on performance indicators. This funding is usually set aside, and can be a policy initiative by the government to encourage the universities to behave a certain way. For example, if \$10 million is set-aside for quality improvement in Ontario, the universities will submit plans to adhere to this policy initiative and obtain as much of these earmarked funds as they can (Lang 2005, p. 10).

## **Ontario Operating Grant**

### *Overview*

Enrolment-based formulas in Ontario are founded on a single unit consisting of one student in one course. These formulas can also be weighted by program, year level, university type, disciplinary sector, or geographic location. Weighted formulas often set a base cost, usually the instruction of a general arts student in first year, and then weight the more costly programs as a multiple of the base (Lang 2005, p. 4). Their effectiveness is dependent on whether the weights represent the actual cost structures. For example, if the weight of a medical program is 2:1 but the spending patterns indicate 5:1, it will lack financial credibility and cannot perform as an instrument of policy (Lang 2005, p. 5).

Formula funding has been used in Ontario since 1967-68, and funding entitlement is based on the relative level of weighted enrolment known as basic income units (BIUs). The weights are not intended to govern internal resource allocations, but are intended to ensure equity in the sense that all universities are subject to the same formula, calculated the same way. Students in general arts and science courses receive a weight of 1.0, while students in honours, professional, and graduate programs is related on a costing analysis performed in the late 1960s (Stenton 1992, p. 21-22). For example, if the costing analysis revealed that the cost of educating a student in a medicine program was five times greater than a general arts program, the medicine program would have received a weight of 5.0. The funds are transferred to the university in the form of operating grants.

The Ontario funding formula was linear from 1967-68 to 1986-87. Prior to 1975-76, the government set the BIU value. For example, the government would choose to set it at a certain value such as \$1,000. If the tax base declined, it could potentially run a

deficit if enrolment increased. In 1975-76, the government determined the dollar amount of grants for the province and divided by the total number of BIUs in the province to get the BIU value. In 1976-77, the formula consisted of a fixed and variable component. The fixed component was based on historical enrolment, and the variable component was based on a moving average of recent enrolment activity (Stenton 1992, p. 21-24).

Corridor funding was implemented in 1987-88 as a means of handling enrolment instability. The base level or mid-point consisted of a moving-average of historical BIUs. If the moving-average BIUs were within a corridor range of +/- 3 percent of the base level, their grant would remain unchanged. If the university exceeded the corridor, they would not receive any grant for those students. If the university fell below the corridor range, they would lose some of their grant (Stenton 1992, p. 23-24, 352).

There are two main types of grant that encompass the Ontario operating grant. The first is the basic operating grant, which is enrolment driven, and calculated using Ontario's funding formula. The second consists of separate grants that are not calculated using the funding formula. The current funding formula is as follows, and only includes BIU eligible FFTEs, which are explained in detail in the next section of this chapter:

**TABLE 4: Basic Operating Grant**

<p>Total Operating Grant = Basic Operating Grant + Other operating formula grants + non-operating formula driven funds</p> <p>Basic Operating Grant = (BOI – Standard fee) where:</p> <p>(1) <math>BOI = \text{Ministry BIU Value} \times \sum_i^n BIU_i</math></p> <p>(2) <math>BIU_i = (EFFTE_i \times BIU\_WEIGHT_i)</math></p> <p>(3) <math>\text{Standard fee} = \sum_j^c \text{Ministry standard Fee Value}_j \times EFFTE_j</math></p> <p>(4) <math>EFFTE = \text{summer EFFTE} + \text{fall EFFTE} + \text{winter EFFTE}</math></p> <p>(5) <math>\text{summer EFFTE} = \text{summer term 1 EFFTE} + \text{summer term 2 EFFTE}</math></p> <p>(6) <math>\text{summer term 1 EFFTE} = EFCE \div \text{full-course load} \div 2 \text{ terms}</math></p> <p>(7) <math>\text{summer term 2 EFFTE} = EFCE \div \text{full-course load} \div 2 \text{ terms}</math></p> <p>(8) <math>\text{fall EFFTE} = EFCE \div \text{full-course load} \div 2 \text{ terms}</math></p> <p>(9) <math>\text{winter EFFTE} = EFCE \div \text{full-course load} \div 2 \text{ terms}</math></p> <p>(10) EFFTE denotes the BIU eligible FFTE.</p> <p>(11) EFCE denotes the BIU eligible full-course equivalent or credit weight</p> <p>Notes:</p> <p>(i) “i” = ministry program category; “j” = ministry standard fee value</p> <p>(ii) Graduate students generate FFTEs differently. 1 full-time student in a term = 1.0 FFTE; 1 part-time student in a term = 0.300 FFTE. Full-time/part-time status is determined by the School of Graduate Studies (SGS).</p> <p>(iii) The fiscal year is defined as summer of year y, fall of year y, and winter of year y+1. For 2007- 08, the fiscal year is summer 2007, fall 2007, and winter 2008. This is also referred to as “3-term”.</p> <p>(iv) Other faculties have different full-course load assumptions, and students taking courses in other divisions may generate different FFTEs per outside course taken.</p>
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In addition to the basic operating grant, other grants are illustrated in the next table, and are current as of fall 2009.

**TABLE 5: Non-Formula Operating Grants**

Grant Name	Funding Formula (yes/no)
Accessibility/Expansion Funds	no
Mission Related Institution Specific Envelope	no
Research Overheads Infrastructure Envelope (ROIE)	no
Access to Opportunities Fund (ATOP)	no

### *The Funding Formula Makes the Model Necessary*

Since the funding formula is clearly defined, institutions can precisely calculate their grant. In jurisdictions such as Ontario, grants come from the taxpayer, and institutions have an obligation to be fiscally responsible and remain solvent. For example, if grant revenue is expected to decline due to a drop in computer science enrolment, institutions could choose not to replace tenured faculty as they retire. Without a model, an institution would not know the grant implications from the decline, and could hire tenured faculty to replace the retirees. Further compounding the problem, the abolishment of mandatory retirement at the end of 2006, could make an institution obligated to pay these individuals for many years following age 65.

The funding formula makes the “flow-through” of grants possible. For example, if an institution is using RCB/RCM, they could allocate the grant to divisions, the same way in which it came to the institution through the funding formula. It is dangerous not to have a projection model in this case because the institution would not know how to allocate the revenue to the division, or be able to predict future grant, ultimately making it difficult to do RCB/RCM.

## **BOI Calculation Components and BIU Eligibility**

### *BIU Value and Effective BIU Value*

The basic operating income (BOI) is calculated by multiplying the BIU value by the  $\sum_i^n \text{BIU}_i$  where “i” denotes the ministry program category. The BIU value is a function of the BIU weight and distribution of enrolment by program category set by the government (Stenton 1992, p. 182-183). The BIU value was to be escalated each year in order to maintain present standards of quality, provided the government had the means. The current BIU value is \$5,110, and has not been changed in the past decade. The Effective BIU value takes into account all grants, and can be substituted into the formula in place of the BIU value. In 2008-09, the effective BIU value was estimated to be \$5,735.

### *Formula Program of Study Category*

A formula program of study (FORPOS) category is a 3 digit ministry program category defined by the Ontario Ministry of Training, Colleges & Universities (MTCU) Operating Grants Formula Manual. The acronym post denotes program of study, and will be used throughout this thesis. It will be referred to in the remainder of this thesis as ministry program category. Graduate FORPOS codes typically span the 200 series, while undergraduate codes span the 100 series with a few codes in the 400 series, with each category containing a basic income unit (BIU) weight. The categories and weights in FAS are displayed below:

**TABLE 6: Undergraduate Formula Post Categories in FAS**

FORPOS Code	Diploma Weight per Term	Bachelor Weight per Term	Description
103	1.000	1.000	Arts 1st yr Honours and General yr 2-4
104	-----	1.500	Arts yr 2-4 Honours
105	1.000	1.500	Commerce and Business Administration
123	1.000	1.000	Science 1st yr Honours and General yr 2-4
124	-----	2.000	Science yr 2-4 Honours
178*	-----	1.625	Arts yr 2-4 Honours
180*	-----	2.000	Science yr 2-4 Honours

\*The Concurrent Teacher Education Program (CTEP) has two codes; Arts 178 and 180. The CTEP Arts weight associated with code 178 weight is higher due to a total claim of 7.5 BIUs over 5 years which is the same amount that the government would fund if a student first pursued an HBA (5.5 BIUs) followed by teachers' college (2.0 BIUs).

**TABLE 7: Graduate Formula Post Categories in FAS**

FORPOS Code	Diploma Weight per Term	Masters Weight per Term*	Doctoral Weight per Term	Description
246	1.000	1.333	2.000	Engineering (Geology)
249	1.000	1.333	2.000	Geography
252	1.000	1.000	2.000	Humanities
257	1.000	1.000	2.000	Mathematics
263	1.000	1.333	2.000	Physical & Biological Sciences
265	1.000	1.333	2.000	Psychology
268	1.000	1.000	2.000	Social Sciences – Other
271	1.000	1.333	2.000	Environmental Science
279	-----	1.333	2.000	Urban & Regional Planning
285	1.000	1.333	2.000	Computer Science

\* Specials and year 1 PhD students who began their studies directly from a bachelor program also carry the Masters weight

#### *Basic Income Units (BIU)*

BIU weights are assigned by the Ontario operating grant formula. Most of these weights have been in place since 1967. These weights are displayed on the previous page. Students admitted directly into the PhD program without completing a Masters are funded at the Masters weight for the first year of study. In the student information

system at the University of Toronto, known as the repository of student information or simply by ROSI, the students' program of study code has a "U" appended to the end to denote these students. In the second year and above, they are funded at the PhD weight.

**TABLE 8: Graduate BIU Minima/Maxima for a given FORPOS code**

Program	Weight	Minima	Maxima
PhD*	2.000	21	27
Masters	1.333	4	8
Masters	1.000	3	6

\* Includes BIUs accumulated at the Masters level.

*Graduate BIU Maxima Adjustment*

Students who are still in attendance and who have reached their maximum limit in cumulative BIUs allowed by the Ontario Operating Manual are reported as ineligible for financial support purposes, and no further BIUs may be claimed on their behalf. If a student is partially eligible, they only generate part of the BIU, as ineligible students do not generate BIU. For example, if a PhD student begins the fall term with 26 cumulative BIUs, the student will accumulate one more BIU in that term to get to 27, not 2. BIUs accumulated for special students (NDEG) and exchange students are not counted towards cumulative BIUs.

*Graduate BIU Minima Adjustment*

If, upon graduation, the total units claimed for a student fall short of the indicated minimum for his or her program, the shortfall may then be claimed as a minimum adjustment. Since it is not possible to predict on given reporting dates whether particular students will in fact be graduating at the conclusion of the semester being reported on,

claims for students under the minimum provision should be made after they graduate.

The university receives the funding for the shortfall of BIU Minimum less BIU accumulated. For example, if a student completed a Masters in Economics in 2 terms, this student would have accumulated 2 BIUs (1 FFTE per term multiplied by 2 terms multiplied by a BIU weight of 1). The university would receive the funding for the additional 1 BIU to reach the minimum.

### *BIU Eligibility*

#### *Ineligible students*

Students are automatically ineligible if they fall under one or more of the following categories.

- a) Students whose program of study is not funded (for example, Mathematical Finance in FAS).
- b) If every course a student is taking in a given term is not funded by MTCU. For example, if a student is only taking the professional experience year, he/she would be ineligible, as that course is not funded by MTCU.
- c) If the student is part of an exchange that is either classified as full cost recovery or not claimable to the Ministry.
- d) If the student is taking all of his/her courses for the session as an auditor.
- e) If the student is registered in the first year of an undergraduate degree program, but has not completed the requirements for the Ontario Secondary School Diploma or equivalent. The session the applicant is in and the session declared for the requirement completion must be the same. For example, if a student was first year in fall 2008, and the session declared for the completion requirement was fall 2007, this student would not be coded as ineligible by this category.
- f) International students (there are some exceptions).
- g) Students who are incoming exchange students.
- h) Students who have maximized the allowable BIU in a given ministry program category.

Approximately 18 percent of the graduate domestic population is ineligible as a result of maximizing the BIU. Approximately 99 percent of the graduate international FFTEs in the fall term are ineligible. Ineligible students become eligible when their legal

status changes to domestic and they have not maximized the BIU for a given ministry program category, or their legal status is international but they pay the lower tuition fee (diplomats etc. – see above). Finally, an ineligible student who is paying the low fee, and begins a new graduate program with a different ministry program category becomes eligible. For example, a domestic student who completes a PhD in History and begins a PhD in Computer Science would once again become eligible.

### *Eligible Domestic Students*

These are domestic students (Canadian citizens or permanent residents) who do not fall under any categories above. Eligible students can also be international if they are paying the domestic tuition fee as a result of one of the “Status Change Categories” on the next page.

Approximately, 82% of the graduate domestic FTEs in the fall term are eligible. Approximately 1% of the graduate international FTEs in the fall term are eligible. Eligible students become ineligible when their legal status changes to international, and they pay the high tuition fee, or they meet or exceed the maximum BIU for a given ministry program category.

### *Eligible International Students*

International students who do not fall under any of the categories in (a) and have the following “Status Change Exemptions” pay the domestic tuition fee. The codes in brackets correspond to the ROSI codes from SIS.INTL\_EXEMPTION and SIS.EXMP\_REASON. The source of the documentation is Student Accounts, in Financial Services.

- a) Students (A2) who are dependents of Canadian citizens of Canada
- b) Students (B2) who are dependents of permanent residents of Canada
- c) Students (B3) who are or who are dependents (B2) of persons who have applied for permanent resident status may qualify for exemption if they have met all the preliminary immigration requirements for permanent resident status (for example, have received preliminary/provisional acceptance/approval, or approval-in-principle).
- d) Students (C1) who are (or who are dependents (C2) of, or who are staff members of) diplomatic or consular officers (C2), or representatives or officials of other countries, or of the United Nations (or any of its agencies), or of any intergovernmental organizations of which Canada is a member, and who, with official accreditation from the Government of Canada, have entered Canada or are in Canada to carry out their official duties; or a member of a foreign military force (C3) or of a civilian component thereof (C3), and any dependents of such personnel (C4), admitted to Canada under the Visiting Forces Act.
- e) Students (D1) who are or who are dependents (D2) of visitors who are authorized to work in Canada having been issued a work permit. (Note 1) Visitors who are graduate teaching or research assistants are excluded from this category. (Note 2) Students holding the Citizenship & Immigration Canada Off-Campus Work Permit are not eligible for this exemption.
- f) Students (E1) students who are or who are dependents (E2) of persons who: have been determined to be protected persons, including Convention refugees or persons in need of protection; are refugee claimants who applied to the Federal Government for Convention Refugee status prior to January 1, 1989.
- g) Students (F1) participating in an Ontario government-sponsored exchange agreement (for example, participants in the Ontario-Jiangsu Academic Exchange Agreement between the Ontario Ministry of Education and Training and the Higher Education Bureau of Jiangsu Province, China).
- h) Status Changes (LS) - If a students' status in Canada changes during the session, they may become exempt under one of the "Status in Canada Exemptions" listed above. If the status change happens, their fees will be adjusted in the current session, provided the status change occurs before November 1 in the fall session, or before February 1 in the winter session. Students must report their status change and present supporting documents to their Registrar prior to the above deadlines. However, if a status change effective before these dates is reported with a minor delay, fee adjustments may still be possible. Students need to consult their Registrar.

Note 1 - For purposes of this document, a dependent of a person includes his/her: a) spouse, b) unmarried child, or c) spouse's unmarried child. Dependent status must be fully documented and must have been established for a minimum of three years.

Note 2 - Please note that these provisions are paraphrased from the Ontario Operating Funds Distribution Manual which is the authoritative document in any dispute over fee level. Consult your Registrar with any questions or problems.

### *Transfer of Graduate BIU Entitlement*

Students transferring into the Ontario system with advanced graduate standing from other universities will have the number of BIUs ordinarily associated with the obtaining of such standing attributed to them. For example, if a student completes a masters program in Psychology in British Columbia and begins a PhD program in the same data element at U of T, the student will begin the PhD program with 8 BIUs attributed to them.

A graduate student transferring from one university to another within the Ontario system shall transfer only the remainder of his or her maximum total units. For example, if a student completes a Masters in French from McMaster (6 terms, all FT) and begins a PhD at the University of Toronto, this student starts off at U of T with 6 BIUs accumulated. If a graduate student begins a new graduate program under a different ministry program category, their cumulative BIUs start at 0 for the new ministry program category.

Ineligible graduate international students who become eligible (for example, an international student from Jamaica who becomes a Canadian citizen) will have the number of BIUs attributed to them as if they had always been an eligible student.

Programs can be ineligible in and of themselves if they are not funded by the government. Students in ineligible graduate programs that become eligible graduate programs will have the number of BIUs attributed to them as if they had always been in an eligible program. In FAS, the mathematical finance program is ineligible. When a university creates a new graduate program, and some categories of undergraduate program(s), it is not automatically eligible for BIU funding. The university must submit

an application to the Ontario Council on Graduate Studies (OCGS) for approval. The OCGS reviews the documentation, and decides whether it will be eligible for counting and assigns a program weight. If an institution wants to create a new program and not go through the OCGS approval process, the program is ineligible for BIU funding. All members of the Council of Ontario Universities have agreed not to do this.

### **Standard Fee Calculation**

The standard fee is a deduction per term from the BOI in recognition that institutions collect tuition fees directly. Standard fee levels have been frozen since 1996, and depend on the ministry program categories, and are assigned as follows. For undergraduate students, the standard fee is \$2,386 unless the program category is dentistry (\$3,035), engineering (\$2,591), or medicine (\$3,035). For graduate students, the standard fee is \$1,198 per term. Standard fees are calculated by multiplying the fee by the eligible FFTE.

### **Ontario Basic Operating Grant Calculation**

Suppose a student is working on an MA in Geography, and was FT in summer, fall, and winter. This individual had 2.667 BIUs accumulated by the end of the previous year. The Grant calculation would be as follows.  $(\$5,110 \times 4 \text{ BIUs}) - (\$1,198 \times 3 \text{ FFTEs}) = (\$20,440 - \$3,594) = \$16,846$ .

Suppose a student is working on a PhD in English, and was FT in summer, fall, and winter. This individual had 18 BIUs accumulated by the end of the previous year.

The Grant calculation would be as follows.  $(\$5,110 \times 6 \text{ BIUs}) - (\$1,198 \times 3 \text{ FFTEs}) = (\$30,660 - \$3,594) = \$27,066$ .

Suppose a student is working on a PhD in Mathematics, and was PT in summer, FT in fall, and PT in winter. This individual had 26 BIUs accumulated by the end of the previous year. The Grant calculation would be as follows:

**TABLE 9: Ontario Grant Sample Calculation**

Summer	$(\$5,110 \times 0.6 \text{ BIUs}) - (\$1,198 \times 0.3 \text{ FFTEs}) = \$2,706.60$
Fall*	$(\$5,110 \times 0.4 \text{ BIUs}) - (\$1,198 \times 1 \text{ FFTEs}) = \$846.00$
Winter	Ineligible due to BIU maximization
Total	\$3,552.60
*Illustrates the case where an FFTE is eligible, but only attracts partial BIU due to the BIU Maxima being reached.	

### Summary

In Ontario, formula funding is generally used allocate operating grants to universities. The operating grant consists of the basic operating grant and non-formula grants. The formula does not allocate resources directly to the functional areas of the universities, and is only concerned with equity among programs. This is in contrast to U.S. centrally planned state systems in which formulas allocate resources directly to the functional areas. BIU weights, BIU values, and standard fee values are exogenous to the FAS model at the divisional level.

## **Inputs to the Model**

### **Input 1 – The Ministry Count Modified for FAS**

#### *Introduction*

The Ministry of Training, Colleges and Universities (MTCU) collects statistical and financially related data on students studying in Ontario universities and related institutions. Collectively this information makes up a standard report used by all universities in Ontario called the University Student Information System-University Affairs (USIS-UAR) Report (MTCU, 2000, p. v). The purpose of this chapter is to describe the MTCU count submission requirements, the modifications made to it afterwards by FAS, a discussion on the various count tables produced for use in later chapters.

From this chapter forward in this thesis, the count file refers to the MTCU count after the FAS modifications. The count tables refer to tables produced from the count file, and are used for other purposes in the model, such as student flow-through rates.

#### *Ministry of Training, Colleges and Universities Count Submission*

##### *Active Records*

The MTCU requires information on all students taking part in courses that lead to a post- secondary qualification (MTCU, 2000, p. 2.2). Special cases to report include students on a work term; students from the reporting institution who are temporarily visiting another institution; students from outside Ontario attending the reporting

institution through a special educational agreement; and graduate students who have exceeded the maximum allowable Basic Income Unit (MTCU, p. 2.3).

### *Inactive Records*

The MTCU does not require information on students taking courses that do not lead to any post-secondary qualification. These courses are called general interest or non-credit courses (MTCU, p. 2.2). In addition, visiting graduate students, postdoctoral fellows, and outgoing exchange students are not reported.

Special cases not reported include students who register in the fall, but do not start taking courses until the winter term; students who have taken a term off and intend to return in a subsequent term; students for whom a BIU minima claim is being made as they have actually left the institution; students visiting your institution from another institution to avoid double counting in the total provincial student body (MTCU, p. 2.4).

In cases where there is a masters and doctoral registration under the same ministry program category for a given student, the record that maximizes the basic income unit is reported, while the other record is not reported in the count. For example, if a student is dually registered as a masters and PhD student in computer science, the PhD record is submitted because it maximizes BIU, the masters is not.

### *Duplicate Records*

If students are allowed to register in more than one ministry program category classified program simultaneously, the institution may submit duplicate records with one being designated as the major record. All others are designated as “minor records”. The major record relates to the program in which the student spends most of the time (MTCU,

p. 2.8). If they both records are eligible, then the OISUT record would be set to part-time. SGS records take precedence over other primary orgs, given the same full-time/part-time status.

The hierarchical sequence for determining the major record where both are eligible for funding is as follows: (1) In the case of a dual registration (meaning what we would call a true dual registration wherein the student is concurrently registered in a masters and doctoral program in the same session), BIUs are maximized by simply selecting the registration that yields the highest BIU as the primary record; (2) Full-time in any program takes precedence over part-time in any program; (3) Graduate studies takes precedence over undergraduate given the same full-time/part-time status; (4) There cannot be 2 full-time registrations. If there are 2 full-time registrations, one is set to part-time following the sequence of precedence except for Post Grad Medical Education (PGME). Any program takes precedence over PGME. PGME records are always flagged as the secondary or tertiary record for students with multiple registrations. If the primary record is full-time, then the PGME record is made ineligible.

Some examples of dual registrations across different program categories include (i) the JD Law and MA in Political Science, Industrial Relations, Economics, Criminology, or Russian & East European Studies. Students registered in the combined program of JD/MA are charged the Law tuition fees; (ii) JD Law and PhD Philosophy where students are charged Law tuition fees in years 1 and 2 and SGS doctoral stream tuition fees in years 3 and 4; (iii) JD Law and PhD Economics students are charged Law fees in years 1 and 4 and SGS doctoral stream fees in years 2 and 3.

### *The Submission to the Ministry*

Data must be submitted four times per year, in the fall, winter, spring, and summer. Once the information is submitted by the institution, the MTCU performs edit checks on it through a Statistics Canada Edit program. In the case of the FAS at the University of Toronto, there is no spring term, so there are only three submissions. If there are no errors, an audit report is printed and sent to the institution. If there are errors, the institution must correct the errors until the data are free of errors. Once the data are free of errors, an audit report is sent to the institution (MTCU, 2000, p. 1.1).

For institutions reporting a spring term, the count date is the end of June, and the due date to MTCU is in mid-August. For institutions such as the University of Toronto report a joint spring/summer count, and the due date is mid-September. The count date for the fall term is the beginning of November, and the due date to MTCU is in mid-December. Finally, the winter count date is at the beginning of February, and the due date is in mid-April (MTCU, 2000, p. 1.1). Institutions are also permitted to make adjustments up to eight working days after the audit reports are distributed. Typical adjustments include adding and deleting students or changing their BIU eligibility status. It is the institution's responsibility to ensure that over claims are not made and no legitimate entitlement goes unclaimed (MTCU, 2000, p. 3.8).

At the University of Toronto, to be counted in the MTCU count for a term, a student must satisfy three criteria. The first is that they be registered on or before the count date. The second is the date at which they selected their courses must be less than or equal to the count run for a given term. Finally, they must be enrolled in at least one course on or before the count date. It is essential that departments remain aware of these

dates and backdate where applicable to ensure students are counted accurately, as errors can not be recovered by the university.

The MTCU count is run on the count date outlined by the Ministry. The MTCU count consists of the running of two programs coded in Natural Programming Language. The first is the MTCU extract, the second is the master file. Once the master file is run, the submission is provided to the university's P&B office, which run their own Master Planning SAS program that re-classifies variables for the purpose of disseminating the information to faculties in a form that is less cryptic than the actual MTCU submission. For example, the fee category is one of the data elements submitted to MTCU with possible values of 1 through 4 that denotes whether a student is eligible for Ontario government funding. The staff in the P&B office take the fee category data element and re-label it "fee category text" with the values "ineligible" for everything equal to one, and "ineligible" for everything else. After the Master Planning SAS program is run, the final count is stored in Microsoft Excel and uploaded to the Internet through COGNOS with several re-coded data elements displayed for use in faculties. The Microsoft Excel version of the final count is then converted to SAS and sent to FAS.

#### *Count Inclusion and "Lost" BIUs*

To be counted in the MTCU count for a term, a student must be both registered on or before the count date (both the REG\_STS\_EFF\_DT and the STATUS\_EFF\_DT must be less than or equal to the Count Date for a given term. Both the REG\_STS\_DT and the REG\_ACAD\_ACT\_DT must be less than or equal to the Count Run for a given term)

and enrolled in at least one activity (REG\_ACAD\_ACT\_STS = APP) on or before the count date.

It is essential that departments remain aware of these dates and backdate the REG\_STS\_EFF\_DT and STATUS\_EFF\_DT where applicable. In addition, departments should make sure that students who are taking graduate courses have their activity entered accurately in ROSI. For every FT PhD FFTE lost in a term, it costs FAS \$9,022. Errors in data entry can not be recovered by the university at a later date.

**TABLE 10: Count Dates by Term**

Term	Cont Date	Count Run*
Spring/Summer First Term	June 4	June 22
Spring/Summer Second Term	July 23	Aug 10
Spring/Summer Full-courses	June 30	Aug 10
Fall	Nov 1	Nov 15
Winter	Feb 1	Feb 15

\* Future dates may vary depending on where the weekend falls

Students must be enrolled in an activity (REG\_ACAD\_ACT\_STS = APP)

*Registration Status (SIS.REG\_STS table on ROSI)*

- 1) REG\_STS\_DT – The actual date that a person enters the registration status onto the student’s record.
- 2) REG\_STS\_EFF\_DT – The date the registration status is recorded as effective onto the student’s record, which allows for backdating.

*Academic Activity (SIS.REG\_ACT\_STS table on ROSI)*

- 1) REG\_ACAD\_ACT\_DT – The actual date that a person enters the academic activity status onto the student’s record.
- 2) STATUS\_EFF\_DT – The date that the academic activity status is recorded as effective onto the student’s record, which allows for backdating.

### *Data Corrections Made by FAS*

The first step in modifications is to make several corrections to the count, which include the following: (1) Domestic students who were reported as paying international fee were corrected; (2) The BIU weights for 10 doctoral student records were corrected to reflect the fact they entered the doctoral program directly following their undergraduate; (3) Graduate departments that became part of FAS (comparative literature, criminology, drama, European, Russian & Eurasian studies, history and philosophy of science and technology, mathematical finance, medieval studies, and industrial relations) were re-coded in all historical data. The names P&B used for FAS departments were re-coded to reflect current names used within FAS. These departments were simplified into academic bridging, bioinformatics, commerce, computer science, other undergraduate, and Woodsworth college. Historical computer science records that had the incorrect degree type for special students were corrected; (4) Records with a ministry program category of 108 (fine and applied art) were converted into either honours (104) or general & year 1 honours (103). The rationale for this change was that the 108 code denoted a specific program at the Mississauga campus and should not have existed at St. George campus. The rules in the extract and master file have since changed to reflect this. Prior to summer 2005, Computer Science was reported to MTCU with a BIU weight of 1.000 for the masters program. Starting in summer 2005, Computer Science was reported to MTCU carrying a BIU weight of 1.333 for the masters program. The government changed the weight as a result of several institutions reporting these students as science students carrying a weight of 1.333. Computer science students use computer labs, which would justify a higher cost to educate them. Rather than punish the institutions that were

in a sense behaving strategically, they created a category specifically for computer science. In 2005-06, the Ministry implemented a ministry program category (285) for graduate computer science with a BIU weight of 1.333 for the masters program. Previously, computer science had a weight of 257 and BIU weight of 1.000 for the masters program. As a result of this change, the ministry program category of all graduate computer science records was recoded accordingly. (5) The funded cohort is an internal U of T policy with a set of criteria that determines which graduate students receive funding from the university. The funded cohort indicator for some undergraduate students was re-coded to “no” as the funded cohort only pertains to graduate students. These students were dually registered in graduate / undergraduate programs, and were part of the funded cohort for graduate, but their undergraduate record somehow ended up in the funded cohort too; (6) Gender was corrected for students who were not recorded properly through consultations with the assistant registrar for the purpose of producing accurate statistics; (7) The session of first entry at U of T was recorded for students who did not have one in the MTCU count; (8) Professional masters programs are graduate programs that focus on employment upon graduation, and are generally terminal meaning they do not lead to a doctorate.

The following graduate degrees (master of financial economics (MFE), master of global affairs (MGA), master of industrial relations (MIHR), master of spatial analysis (MSA), master of planning (MSPL), master of urban design (MUDES), and master of visual studies (MVS)) were coded as professional masters programs. The masters program in english, creative writing stream was also coded as a professional masters for internal purposes, although it is not formally recognized by the MTCU as such; (9) In

2007-08, the double cohort phenomenon in Ontario that came from the elimination of OAC (grade 13) had reached the masters level of graduate studies. In 2003-04, the government introduced a graduate expansion policy that allowed unlimited growth of graduate schools in Ontario until 2011-12. Graduate expansion funding was given out to institutions for growth beyond 2004-05. In 2006-07, the graduate botany and zoology departments in FAS were re-organized into two new departments called ecology and evolutionary biology (EEB) and cell and systems biology (CSB). For the purposes of comparing current graduate expansion to 2004-05, an exercise was undertaken by the two new departments to re-code all former botany and zoology students that existed in 2004-05 and beyond. The methodology the departments used was to look at each individual student and determine which new department they would have been in, had they been in existence in the past. Upon completion of the exercise, both chairs signed off on the list, and the past enrolment headcount data were re-coded; One visiting graduate student taking an EEB course was re-coded since they were originally coded as zoology (10) FTEs and BIUs to three decimal places; (11) Visiting graduate students and postdoctoral students were coded as inactive to be consistent with government regulations (MTCU, 2000, p. 2.2); (12) For some degree students, the year of study was not present and needed to be imputed (13) For some students, the birthday was not reported correctly and was corrected after the count date (14) Prior to 2003-04, the full-time definition threshold was 4.0 FCE for FAS. In 2003-04, this threshold changed to 3.0 FCE for FAS with the exception of Woodsworth College, which remained at 4.0 FCE. Data prior to 2003-04 were re-coded according to the current threshold definition; (15) Several enrolment headcount data elements were re-labeled so they are more intuitive, but most are not used

in enrolment management. Throughout all of these changes, actual BIUs and FFTEs remain unchanged even though in some rare cases, they may have been submitted incorrectly.

The second step is to run a series of data harmonization programs that are explained in more detail in appendix 11. The purpose of these programs is to re-label data elements to more useful names for data dissemination purposes. Data harmonization is also applied to other inputs described later in this thesis.

#### *Calculated Data Elements and Output*

The third step is to calculate two projection data elements called projection year and projection term. These data elements are used to keep track of the year and term in which projections start. The role of these data elements is to enable the model to automatically detect when projections should start, relative to the latest count file. For example, if the latest count file is winter 2009, the projections should start in summer 2009. Two program entry data elements for year and term are used to keep track of the year and term a student began his/her program at the University of Toronto. The role of these data elements is to keep track of student cohorts and ultimately project their flow-through rates into upper years, which is described later in this chapter. The relevance of these data elements is that the overall model does not need to be manually adjusted every time a new count file is available.

The fourth step is to save the count on the network consisting of only FAS data, with over 100 data elements. Most of these data elements are not used in the model, but assist in the creation of tables that are used in the model. For example, gender, ethnicity,

citizenship, etc. These data elements can be used for internal purposes, but they are not modeled.

### *Count Tables (See Appendix 13)*

The fifth step is the creation of 75 tables, produced from the count file for use later in this thesis. The tables produced have two kinds of arrays. The **a** array denotes actuals, and the **t** array denotes targets, which are explained in detail later in this thesis. It is assumed that once actual figures are available, the targets are set equal to the actuals. In these tables, both the **a** and **t** arrays are set to equal.

In terms of nomenclature, **a1** can be interpreted the following way. The **a** denotes an actual, and the **1** corresponds to the calendar year of the winter term which is part of fiscal year defined by summer, fall, and winter. For example, **1** equals 2000-01, **2** equals 2001-02, **20** equals 2019-20. This nomenclature is used throughout this thesis. The first table produced captures when the projections start, which is used throughout the model. Having this table makes it possible for one to go back in time by excluding recent data, and re-calibrating the entire model and all count tables. The first table would now indicate that the projections start as of last fall, rather than the current fall. Basically, one can go back to whatever term they wish, and start the projections from there.

### *Actual Headcount, FFTE, and BIU Tables*

The actual headcount, FFTE, and BIU data are re-packaged, and stored in a series of tables for the purpose of combining actuals and projections in the model for use later in this thesis. These tables are described in further detail in Appendix 13 tables 2-7.

### *Flow-Through Rate Tables*

As part of the fifth step, flow-through rate tables and repeat rate tables, are produced from all of the historical enrolment headcount data (see Appendix 13 tables 8-12). In general, flow-through is defined as the rate at which students move through a curriculum from fall-to-fall based on how they moved through it in the past. Students who do not flow through to the next year level repeat the level they are in. For example, if a program starts with 100 students, 80 may continue to 2<sup>nd</sup> year while 10 repeat the year. 72 may continue from 2<sup>nd</sup> to 3<sup>rd</sup> year with 5 repeating. 72 may continue to 4<sup>th</sup> year, with 0 repeating. The flow-through rate from year 1 to 2 is 80 percent; year 2 to 3 is 90 percent; year 3 to 4 is 100 percent. The repeater rate in this example for first years is 10 percent and 5 percent for second-year.

The longer a program has been in existence, the more data points available for the calculation of flow-through rates. However, small programs can have rates that vary significantly from year to year. Due to this problem, and lack of data points for new programs, the following methodology was implemented to reduce extreme variation in these rates.

Flow-through rate tables are generated for different levels of detail (degree type, department, sector, and degree type aggregate), where degree type contains details down to the degree, and degree type aggregate does not. As a matter of clarification, degree type aggregate spans a number of degree types. For example, a degree type aggregate equal to professional masters would encompass all professional masters programs. The tables are generated using the following methodology for each table, and are shown in appendix 13. (1) year-over-year headcount rates computed for each cohort and year

level. Cohort in this context has to do with when the student began their program, and has no affiliation with the funded cohort; (2) The mean and standard deviation for each year spanning all cohorts is calculated. Missing data points are excluded from the calculation of means and standard deviations; (3) Means that are strictly greater than the standard deviation in absolute value are flagged as outliers and removed.

The methodology described above, is a variant of the method used in the Delaware Study of Instructional Costs and Productivity, produced every three years by the institutional research office at the University of Delaware (University of Delaware, 2010). This study groups programs at public and private institutions in the United States into various program categories based on research intensity of the institution (primarily undergraduate, comprehensive, doctoral, research), and calculates the average cost and productivity for each ministry program category. For example, if all of the private comprehensive institutions with history programs submitted their data to the study, they could then compare their own costs and productivity in history to the average for history in the study, as a benchmarking tool. Once all of the data are collected from the US institutions participating in the Delaware Study, outliers for a given category are defined as being more than two standard deviations from the mean in absolute value. These outliers are removed from the study; (4) The means remaining from (3) are re-calculated.

### *Target Imputation Tables*

Appendix 13 tables 13 – 48 consist of five types of tables for the purpose of imputing further detail to targets, which will be explained later in this thesis. Each type of table has sub-tables with varying detail (degree type, department, degree type aggregate, year of study, and campus), where degree type contains the most, and campus

the least. The first set of tables, are the intake rates, which are the rate at which students in any year of study are new to the institution. The second set of tables, are the BIU eligibility rates, which determine how many students generate grants for the university at various levels of detail. For example, close to 100 percent of first-year graduate students generate government operating grant funding for the institution. The third set of tables, consist of the percentage of students paying international fees or “high fees”. For example, all domestic students pay the “low fee”, most international students pay the “high fee”, but there is a small group of international students who pay the “low fee” based on criteria presented earlier in this thesis, such as Diplomatic status. The fourth set of tables, are the funding guarantee rates, which are the rate at which graduate students receive internal funding from FAS. The fifth set of tables are the course band rates, which determine the rate at a given level of detail as to the number of courses students are taking in a given term. These tables were implemented due to FAS deciding to charge students program fees starting in fall 2009 based on course load, rather than on full-time / part-time status. The sixth and final set of tables, are the campus affiliation rates, which apply to graduate students only. These affiliation rates arise out of graduate students choosing to affiliate with a campus through consultation with their home department. For example, if a chemistry doctoral student is being supervised at the Mississauga campus, he/she may choose to affiliate there.

### *Imputed Summer & Winter Term Tables*

In appendix 13 tables 53 – 57, the summer and winter rates are imputed as follows. The summer over previous fall rates were calculated for each year using all count data available. The median of these rates was then used to impute the summer term.

The winter over fall rate was used to impute the winter term. The winter over fall rates were calculated for each year using all count data available. The median of these rates was then used to impute the summer term.

In general, the university enrolment projection model does not operate at the same level of detail, and does not drill enrolment projections down to the departmental and degree type levels of detail. The university model uses moving averages of summer over previous fall rates and winter over fall rates at the divisional level to impute the upcoming summer and winter terms. Applying these high level rates to departments and degree types does not capture their behavior, and assumes they will behave like the entire division. The FAS model presented later in this thesis does project enrolment at a further level of detail, and drills down to department and degree type. The method of deploying a moving average to historical summer over previous fall and winter over fall rates was initially tested at a further level of detail stepping it down to department and degree type. At further levels of detail, it was found that population sizes were relatively small in certain programs, and therefore the rates could vary significantly. A further complication was the change that occurred in the denominator, especially during a period of graduate expansion after 2004-05 in graduate programs. In general, the higher the amount of

detail and the smaller the population associated with that detail, the greater the variation in the rates.

The following two examples of headcount percentage rates illustrate the problem with using moving averages with small populations. In both examples, 0's are excluded from the moving average. In example 1, 50 percent occurs in 2001, and ends up in the moving average forever due to the exclusion of zero. In example 2, there are large spikes in 2006 and 2010 relative to the previous year. The method of taking the median was used in the model to deal with small population sizes.

**TABLE 11: Problems with use of Multi-Year Averages**

Example	2001 Act	2002 Act	2003 Act	2004 Act	2005 Act	2006 Proj	2007 Proj	2008 Proj	2009 Proj	2010 Proj
1	50	0	0	0	50	50	50	50	50	50
2	20	100	0	200	20	85	101.3	101.6	101.6	81.9

*Other Tables Produced*

The remaining count tables consist of average FFTE and BIU weights (58-69) at varying levels of detail followed by the undergraduate departmental distribution (70-72), cumulative BIU tables for each term (73-75), graduate fall full-time headcount (76), graduate special and part-time headcount (77). The average FFTE and BIU weight tables are used in the model, while the others are used as part of the inputs to the model discussed later in this thesis.

## **Input 2 – Fall Targets**

### *Introduction*

Undergraduate targets consist of domestic and international full and part-time headcounts. Graduate targets consist of domestic and international full-time headcounts broken down by department and degree type. Assumptions are made about part-time students and special students, and will be discussed in this chapter. Special students are those who are taking courses, but are not enrolled in a degree program.

The term “array” is used throughout this chapter. An array in this context is a time series dataset where the index denotes the fiscal year. For example, **t1** denotes the target from 2000-01, **t2** would denote the target from 2001-02, **t20** would denote the target from 2019-20. The term ROSI is used throughout this chapter, and it is an acronym for the university’s student administration system. The formal name for the system is the Repository of Student Information. The term target subgroup refers to certain programs that are handled differently during the processing of target data. The target subgroup includes the concurrent teacher education program (CTEP) and the international foundations program.

The purpose of this chapter is to describe the process of obtaining four types of targets (graduate, undergraduate total, undergraduate subgroup, and undergraduate intake), then imputing further layers of detail necessary for enrolment modeling and data dissemination by department and degree type using the count tables that were produced in the last chapter.

## *Four Types of Target Inputs*

### *Target Input Type 1 - Graduate Full-Time Fall Targets*

At FAS, full-time graduate targets (excluding special students) are set between meetings with the Vice Dean (Graduate Education and Research) and each of the graduate department (centers and institutes are included under the definition of department) chairs. The targets that arise from those meetings are submitted as total targets, and include intake. The model developed in this thesis is currently used as a tool to inform the Vice Dean of the revenue implications due to changes in graduate targets. For example, international students typically do not generate operating grant for the institution, while domestic students do. Reducing enrolment in international students and holding domestic enrolment constant can generate more operating grant for the institution, and the model would calculate exactly how much.

Each department receives a standardized Microsoft Excel table once a year to input and update targets. A sample table is shown in appendix 21. Each table in the graduate spreadsheet consists of the following data elements of which the departments provide total full-time fall headcounts for the different categories.

The first data element is division, which denotes the division number within the School of Graduate Studies (1 = Humanities, 2 = Social Science, 3 = Physical Science, and 4 = Biological Science). The sector data element is the same except the sciences are combined into one category called science. This definition is consistent with the definition of sector used in the model. The second is unit, which contains the abbreviated name for the department (secondary org in ROSI). The unit data element is re-coded in

the model to secondary organization, since unit refers to undergraduate or graduate in the model. The third is domestic-international which denotes domestic and international students. The fourth is funded cohort, which keeps track of how many students the department expects will receive funding from FAS. The fifth is ROSI type which is synonymous with the type of program data element (for example, DOC for doctoral, MAST for masters, PMAS for professional masters). The sixth is degree type which contains doctoral, masters, and three slots allowing for up to three multiple professional masters programs per department. The seventh through eleventh data elements consist of the fall terms starting in 2004 and running to 2011, which is the expected end of graduate expansion.

Every fall, when actuals are available, the targets are replaced with them using a computer program that automatically extracts them from the enrolment headcount data and inserts them for each department.

In addition to the departmental tabs, there are summary sheets for the purpose of conveying aggregate information to P&B for university-wide planning. The reason for the aggregation is that the P&B enrolment projection model does not step down their enrolment and revenue projections to the departmental level, and they would incur additional work tallying all of the departmental tables individually.

With each enrolment change that departments propose, the Vice Dean has the authority to review and approve/deny the changes. Approved changes are built into the model with an incrementing version number attached to the end of the file name. Formal changes for the next academic year are typically allowed up to late November of the current academic year. All past versions are kept for historical purposes as to when

changes were made. A sample of the input spreadsheet for chemistry is shown in appendix 21. The spreadsheet tables are read by a computer program, followed by a data harmonization computer program (see appendix 11) that re-codes data element names for compatibility with the model, and is saved as **fall\_ft\_grad.sav**.

### *Target Input Type 2 - Undergraduate Subgroup Targets*

The first undergraduate target spreadsheet is for undergraduate programs that need to be tracked separately because they are unique and behave differently, or have been phased out. The first type of program in this subgroup is the 5-year concurrent B.Ed. degree that students can enter after completion of secondary school. This program is offered jointly through the Ontario Institute for Studies in Education (OISE) and FAS. The behaviour in this program is unique because there is an additional year, different program weights from the MTCU, and the program is collaborative across two faculties. A second type of program is the international foundations program (IFP) which offers international students intensive English language training. Successful completion of the IFP will guarantee admission to the FAS or Engineering with one full credit. The output of this table is as follows, once it is read into SPSS automatically (see appendix 23):

```
t unit division forpos campus dom_intl ftptrgst
degree_type_aggregate sector department degree_type t1 TO t20
notes
```

### *Target Input Type 3 – Undergraduate Total Targets*

Undergraduate targets are determined through discussions between the Dean, the Vice-Provost of Planning and Budget, and the Registrar. These discussions involve a series of meetings where the model is used in consultation with P&B to run enrolment scenarios and project revenue. These targets are provided in four categories full-time

domestic, part-time domestic, full-time international, and part-time international. The targets are currently not split into degree type or department, and are kept at a high level of detail by choice of senior management.

In addition, since undergraduate students typically take courses from many departments, it is difficult to assign a single department to a student. For example, if a first-year student is taking three math courses and two economics courses, it raises the question which department they belong. Graduate students are easy to assign a department to because they typically take all of their courses in the department for which their studies encompass. For example, a doctoral student in economics will likely take only economics courses.

The undergraduate targets are stored in a spreadsheet initially, but are read into SPSS. The programs identified in the undergraduate subgroup are automatically subtracted. The output is saved in appendix 22:

```
t unit division campus dom_intl ftptrgst t1 TO t20 notes
```

A notes data element is used to store notes associated with the enrolment. The file is saved with the date and version number (for example, Jan 10, 2008 undergraduate).

#### *Target Input Type 4 – Undergraduate Intake*

In early 2010, the model was modified to be able to feed intakes for a few types of students, while feeding totals for others. This modification arose out of the Provost's request that FAS submit intakes for full-time undergraduate bachelor degree students going forward, rather than total targets for them. The Provost made this request because the university's 2030 plan had FAS declining in total enrolment at the St. George campus. Initially, the Provost wanted to constrain FAS to a total, which was shown to

cause intake spikes in certain years due to cohorts flowing through. For example, suppose the total enrolment was 100 where students were evenly distributed in each year, and the flow-through rate was 80 percent. If next year's total target was 80, intake would need to fall from 25 to 20. If in the following year, the total remained at 80, intake would rise to 32.

Currently, intakes can be fed in for undergraduate full-time bachelor degree domestic and international students. It is worth noting that intakes are typically first-year students, but a small number of them are new to upper-years as well. This is discussed in the next section.

#### *Target Processing and Data Harmonization*

The first step in this section opens the undergraduate total target distribution table that was produced along with many other count tables in the last chapter. This table contains the previous fall distribution of further layers of undergraduate data (excluding the target subgroup) that are not available in the target data (ministry program category, degree type aggregate, sector, department, and degree type). As a matter of clarification, it was stated earlier that it is not possible to assign an undergraduate student to a department. The Dean at the time made the decision to model aggregate data not broken down by undergraduate area (academic bridging, commerce, computer science, etc.). Last year's departmental distribution was used to split the targets into departments.

The department in an undergraduate context consists of a pseudo department assigned based on an algorithm applied during data harmonization. This algorithm assigns undergraduate students one of six departments (academic bridging, bioinformatics, commerce, computer science, concurrent education, other undergraduate,

and Woodsworth college). The algorithm uses a combination of the data elements (degree type, program of study, subject area, and courses) to assign them. The table is linked to the targets from target input 3, and those higher-level targets are distributed to the further levels of detail mentioned above, based on the distribution from the previous fall. For example, if the aggregate target was full-time domestic, it would be split into formula post category, degree type aggregate, sector, department, and degree type, and saved in the following form:

```
t unit division campus dom_intl ftptrgst forpos
degree_type_aggregate sector department degree_type t1 TO t20
```

This new table is then combined with the target subgroup described in target input 2 and saved. The intakes from target input 4 are processed in a separate file in a similar fashion, and combined. A new field called intake mode is introduced to denote where targets will be fed as totals (intake mode equals 0) and where targets will be fed as intake (intake mode equals 1). An additional step attaches the historical distribution of intake to year levels to the file for the purpose of distributing some of the intake directly into upper years. The end result is a complete set of detailed undergraduate targets saved in a table called **target\_ugrd.sav** with the following layout:

```
intake_mode t unit division campus dom_intl ftptrgst forpos
degree_type_aggregate sector department degree_type t1 TO t20
t_intake1 TO t_intake20 yr_pct1 TO yr_pct7
```

The second step is to extract the original graduate full-time targets on a table-by-table basis. The data element names are then harmonized in a third computer program. The output is stored in a file called **target\_grad\_ft\_no\_spec.sav** with the following data elements:

```
t unit division forpos ftptrgst campus degree_type_aggregate
sector department degree_type dom_intl t1 TO t20
```

The fourth step obtains the part-time graduate students and special students from the count table **special\_and\_pt\_grad.sav**. This table contains the students missing from the graduate target spreadsheet mentioned earlier in target input 1. This table is then combined with **target\_grad\_ft\_no\_spec.sav** to obtain the graduate targets table called **target\_grad.sav**. The fifth step combines both the undergraduate and graduate targets, and saves a file called **target.sav** with the column layout below:

```
intake_mode t unit division forpos ftptrgst campus
degree_type_aggregate sector department degree_type dom_intl t1
TO t20
```

All preliminary tables constructed in this chapter are deleted, except for the original target inputs 1 through 3, which are kept for historical purposes. Now that the targets have been processed into one file, now it is time to obtain the further details necessary for enrolment modeling.

### *Flow-Through Rates Applied*

The purpose of this section is to break the targets into year of study through a series of five steps. The first step is to obtain the targets from the previous section and match them up to the previous year's actual fall headcount from count table **last\_fall.sav**. The combined table is then matched with the flow-through rate tables created from the count file, and the level of nesting is shown below, where "yes" denotes a particular level of nesting starting with the highest level at the top and the lowest at the bottom:

**TABLE 12: Flow-Through Rate Table Nesting**

Order	Column	Degree Type	Department	Sector	Degree Type Aggregate
1	unit	yes	yes	yes	yes
2	division	yes	yes	yes	yes
3	campus	yes	yes	yes	yes
4	term	yes	yes	yes	yes
5	full-time/part-time	yes	yes	yes	yes
6	domestic/international	yes	yes	yes	yes
7	degree type aggregate	yes	yes	yes	yes
8	sector	yes	yes	yes	no
9	department	yes	yes	no	no
10	degree type	yes	no	no	no
11	flow-through rate (year 1-2, 2-3, ...)	yes	yes	yes	yes
12	Repeat rates (year 1-1, 2-2, ...)	yes	yes	yes	yes

The order in the table can be thought of as a hierarchy for the purpose of ensuring that all new programs that do not have flow-through rates at a lower level of detail use the rates from higher levels of detail until a rate is found. For example, in 2006-07, the professional Masters in Public Policy was planned as a new program under the graduate public policy department. Since no degree type or department existed at the time, the assumption automatically built into the model in this step was that the program would have flow-through rates similar to a professional masters program (degree type aggregate) in the social sciences sector. In this case, the sector column in the table above would be used to supply the flow-through rates to that program. Although flow-through rates are submitted as part of applications to OCGS for new programs, the model applies a best fit instead, and assumes new programs will behave similar to similar existing programs. In the event of a totally different program layout, the model has a capability of

overriding the rates through an override computer program. Finally, the data are matched up to a count table **start.sav** that indicates when flow-through should start.

The second step involves determining the actual duration of existing programs based on actual and when new programs start, based on the start in the projections. A data element called duration tracks the length of existing programs while a data element called start year new tracks the year programs begin. For example, a start of 9 would indicate 2008-09. A start of 20 would indicate the year 2019-20. A preliminary table called **target\_flowthru\_combined.sav** is saved with the following column layout:

```
intake_mode t unit division forpos ftptrgst campus
degree_type_aggregate sector department degree_type dom_intl
pgm_entry_yr1vl start_flag start_year_newduration calcyr calct
t1 TO t20
t_intake1 TO t_intake20
yr_pct1 TO yr_pct7
year1 TO year7
flowthru_rate1 TO flowthru_rate7 repeat_rate1 TO repeat_rate7
```

The third step involves deploying a flow-through algorithm with the following procedures for each projection year going out to 2019. Procedure (a) is to apply flow-through and repeat rates to the entire dataset regardless of whether total targets or intake targets are being considered. The second procedure only considers total targets. The intake in this procedure is equal to the total minus the total flowed through into upper years. The third procedure considers only intake targets. When considering intake targets, students are flowed through, and the intake is inserted automatically. In both cases, whether dealing with total targets or intake targets, the intake is split based on the historical distribution of intake to all years. For example, if intake is determined to be 1,000 students, and historical data indicate that 90 percent of the intake is year one and 10 percent is year two, 900 will be inserted in year one and 100 in year two respectively.

An example of flow-through when considering total intakes and intakes is illustrated on the next page. For simplicity, repeat rates and intake to upper years is omitted.

*Flow-through Example using Total Targets*

Suppose the following are true:

- i. Fall 2007 actuals are distributed as follows: yr1 15, yr2 12, yr3 11, yr4 11, Tot 49.
- ii. Historical flow-through rates: yr 1 to 2 (90%), yr 2 to 3 (95%), yr 3 to 4 (100%).
- iii. All intake is assumed to be first-year.
- iv. The target for fall 2008 is 60.

To obtain year level for fall 2008, the fall 2007 actuals are flowed through to the next year.

Fall 2008 yr1 = 0 (placeholder)

Fall 2008 yr2 =  $(15 \times 90\%) = 13.5$  rounded = 14

Fall 2008 yr3 =  $(12 \times 95\%) = 11.4$  rounded = 11

Fall 2008 yr4 =  $(11 \times 100\%) = 11$  rounded = 11

Fall 2008 total = 36

Fall 2008 intake into yr1 = (target given – sum of those flowed through) x pct intake to year 1 =  $(60 - 36) = 24$

The Fall 2008 distribution that tallies to the target:

yr1 = 24; yr2 = 14; yr3 = 11; yr4 = 11; Total = 60.

*Flow-through Example using Intake Targets*

Suppose the following are true:

- v. Fall 2007 actuals are distributed as follows: yr1 15, yr2 12, yr3 11, yr4 11, Tot 49.
- vi. Historical flow-through rates: yr 1 to 2 (90%), yr 2 to 3 (95%), yr 3 to 4 (100%).
- vii. All intake is assumed to be first-year.
- viii. The target for fall 2008 is 65.

To obtain year level for fall 2008, the fall 2007 actuals are flowed through to the next year.

Fall 2008 yr1 = 0 (placeholder)

Fall 2008 yr2 =  $(15 \times 90\%) = 13.5$  rounded = 14

Fall 2008 yr3 =  $(12 \times 95\%) = 11.4$  rounded = 11

Fall 2008 yr4 =  $(11 \times 100\%) = 11$  rounded = 11

Fall 2008 total = 36

Fall 2008 intake into yr1 = 65.

The fourth step involves taking the output with years one through seven, and breaking them up into a file for each year with a new data element called year level. A data element called new is defined to denote whether students were flowed through (new = 0) or were intake (new = 1). The headcount is stored in a preliminary data element called **n**. The files are then stacked on top of one another and saved as flowthru.sav with the same column layout as above with the addition of year level and **n**. ROSI allows for 9 years of study for graduate programs, but in the model, 7 and up are recoded as 7. This is also consistent with P&B, as they re-code 7 and up.

The fifth step is to set each target to the appropriate **n** value where the necessary condition is that the index of the loop is equal to the target year. Rows with all zero values in targets **t1** through **t20** are deleted. A data element called new is defined to denote whether or not students are new or returning. The file is saved as **flowthru.sav** with the following column layout:

```
intake_mode t unit division forpos ftptrgst campus
degree_type_aggregate sector department degree_type dom_intl
yrlvl new t1 TO t20
```

All preliminary tables are deleted at the end of this program. As a quality control step, a check is performed for negative flow-through, which can occur when considering total targets. This occurs when the total for this year is less than the total number of students flowing through from last year. If negative flow-through is detected, departments are notified to fix the problem.

### *Imputation of Further Detailed Data Elements*

This next section deals with the imputation of five data elements. These data elements include BIU eligibility, whether students are paying domestic or international tuition fees, the internal eligibility for FAS funding to students known as the funded cohort, the campus that graduate students have chosen to affiliate with, known as campus incidental, course band which keeps track of whether undergraduate students are between three and four half-courses in a given term for the purpose of charging program fees (course band also keeps track of direct entry doctoral students who entered a doctoral program followed by their bachelor degree), and the type of registration. Imputation is necessary as the targets do not contain these layers of detail necessary to calculate operating grants and tuition later in this thesis.

#### *BIU-Eligibility*

BIU Eligibility from earlier sections determines whether or not the institution is eligible for operating grants associated with student enrolment. The degree type table contains the most detail, while the campus table contains the least. The order can be thought of as a hierarchy for the purpose of ensuring that all new programs have intake rates applied to them. A similar hierarchy was also seen in the previous section concerning flow-through rates. The rate used is the first available as one moves up the hierarchy. For example, if there is no rate available at the degree type level of the hierarchy, the next one to check is department, and so on, up to and including campus. The targets are then split into a yes array and no array going out to 2019-20. The yes array is the target multiplied by the intake rate, followed by rounding. The no array is the

target minus the yes array. The files are then split, with the targets being set to either the yes or no array depending on the intake rate.

The first step takes the table with imputed intake and matches it with a series of tables containing the rate of BIU eligibility at various levels of detail. These tables include, from lowest to highest; (i) feecattx\_yes\_degree\_type, (ii) feecattx\_yes\_department.sav, (iii) feecattx\_yes\_sector, (iv) feecattx\_yes\_degree\_type\_aggregate, (v) feecattx\_yes\_ylrvl, and (vi) feecattx\_yes\_campus. They are shown in the table below:

**TABLE 13: BIU Eligibility Rate Tables**

Order	Column	Degree Type Table	Dept Table	Sector Table	Degree Type Aggregate Table	Year Level Table	Campus Table
1	intake_mode	yes	yes	yes	yes	yes	yes
2	term	yes	yes	yes	yes	yes	yes
3	unit	yes	yes	yes	yes	yes	yes
4	division	yes	yes	yes	yes	yes	yes
5	domestic/international	yes	yes	yes	yes	yes	yes
6	full-time/part-time	yes	yes	yes	yes	yes	yes
7	campus	yes	yes	yes	yes	yes	yes
8	year level	yes	yes	yes	yes	yes	no
9	degree type aggregate	yes	yes	yes	yes	no	no
10	sector	yes	yes	yes	no	no	no
11	department	yes	yes	no	no	no	no
12	degree type	yes	no	no	no	no	no
13	% with BIU eligibility	yes	yes	yes	yes	yes	yes

The degree type table contains the most detail, while the campus table contains the least. The rate used is the first available as one moves up the hierarchy. For example, if there is no rate available at the degree type level of the hierarchy, the next one to check is department, and so on, up to and including campus. The targets are then split into a yes array and no array. The yes array is the target multiplied by the rate of BIU

eligibility, followed by rounding. The no array is the target minus the yes array. The files are then split, with the targets set equal to either the yes or no array, depending on the file. The files are then combined. An additional data element called high-low-fee is defined as “low fee” for all eligible domestic students, ineligible domestic students, and eligible international students. The “high fee” is assigned to all ineligible international students. The file is then saved as **imputed\_feecattx.sav** as follows with all preliminary files deleted:

```
t unit division forpos ftptrgst campus degree_type_aggregate
sector department degree_type dom_intl yrlvl new feecattx hl_fee
t1 TO t20
```

### *High/Low Tuition Fees*

Earlier in this thesis, certain criteria were presented, that allow international students to pay the domestic tuition fee, rather than the international fee. Students who pay the international Fee pay the “high fee”, while students who pay the domestic fee pay the “low fee”. The first step takes the table with imputed BIU-eligibility and matches it with a series of tables containing the rate at which students pay the high fee. These tables include, from lowest to highest; (i) hl\_fee\_yes\_degree\_type, (ii) hl\_fee\_yes\_department.sav, (iii) hl\_fee\_yes\_sector, (iv) hl\_fee\_yes\_degree\_type\_aggregate, (v) hl\_fee\_yes\_yrlvl, and (vi) hl\_fee\_yes\_campus. They are shown in the table below:

**TABLE 14: High/Low Fee Rate Tables**

Order	Column	Degree Type Table	Dept Table	Sector Table	Degree Type Aggregate Table	Year Level Table	Campus Table
1	intake_mode	yes	yes	yes	yes	yes	yes
2	term	yes	yes	yes	yes	yes	yes
3	unit	yes	yes	yes	yes	yes	yes
4	division	yes	yes	yes	yes	yes	yes
5	domestic/international	yes	yes	yes	yes	yes	yes
6	full-time/part-time	yes	yes	yes	yes	yes	yes
7	campus	yes	yes	yes	yes	yes	yes
8	year level	yes	yes	yes	yes	yes	no
9	degree type aggregate	yes	yes	yes	yes	no	no
10	sector	yes	yes	yes	no	no	no
11	department	yes	yes	no	no	no	no
12	degree type	yes	no	no	no	no	no
13	% with high fee	yes	yes	yes	yes	yes	yes

The degree type table contains the most detail, while the campus table contains the least. The rate used is the first available as one moves up the hierarchy. For example, if there is no rate available at the degree type level of the hierarchy, the next one to check is department, and so on, up to and including campus. The targets are then split into a yes array and no array. The yes array is the target multiplied by the rate at which international students pay the high fee, followed by rounding. The no array is the target minus the yes array. The files are then split, with the targets set equal to either the yes or no array, depending on the file. The files are then combined. An additional data element called high-low-fee is defined as “low fee” for all domestic students, and international students who pay the low fee. The “high fee” is assigned to international students who are not exempt from the international fee. The file is then saved as **imputed\_hl\_fee.sav** as follows with all preliminary files deleted:

```
t unit division forpos ftptrgst campus degree_type_aggregate
sector department degree_type dom_intl yr1vl new feecattx hl_fee
t1 TO t20
```

*Funded Cohort (funded\_cohort)*

The funded cohort is a University of Toronto specific group of full-time graduate students (masters and doctoral; not professional masters, not specials), who receive an internal scholarship from the university. Each department has its own rules in terms of the range of year levels full-time students must be within, to be eligible for inclusion in the funded cohort. The range is typically one year for masters, up to five for doctoral students (see Appendix 24).

The funding guarantee is the funding package these students receive if they are in the funded cohort. It attempts to ensure that students have the financial resources to focus on their studies, and complete their degrees in a timely manner, as funding ends in most departments after year 5. The minimum level of support with the guarantee in 2008-09 was between \$13,000 and \$15,000 (plus tuition and fees), depending on the department (University of Toronto, 2009 1). The funded cohort rules can be found in Appendix 21. The funds flow to the students from the division through their department.

Under this policy, for example, a student who enters the computer science PhD program directly upon completion of a bachelor's degree will receive at least the guaranteed level of support for the first five years of the PhD. A student who completes a masters degree first would be guaranteed funding for the master's year and the first four of the PhD (University of Toronto, 2009 1). There are two exceptions to the rules. The first is that PhD students who do not pass their comprehensive exam are removed from the funded cohort. The second is that students above their department's maximum year level for inclusion in the funded cohort may remain in the funded cohort at the discretion of the department chair.

The fourth step takes the latest **imputed\_hl\_fee.sav** table and matches it with a series of tables containing the percentage of students in the funded cohort at various levels of detail. These tables include; (i) **funded\_cohort\_yes\_degree\_type**, (ii) **funded\_cohort\_yes\_department.sav**, (iii) **funded\_cohort\_yes\_sector**, (iv) **funded\_cohort\_yes\_degree\_type\_aggregate**, (v) **funded\_cohort\_yes\_yrlvl**, and (vi) **funded\_cohort\_yes\_campus**. They are shown in the table below:

**TABLE 15: Funded Cohort Rate Tables**

Order	Column	Degree Type Table	Dept Table	Sector Table	Degree Type Aggregate Table	Year Level Table	Campus Table
1	intake_mode	yes	yes	yes	yes	yes	yes
2	term	yes	yes	yes	yes	yes	yes
3	unit	yes	yes	yes	yes	yes	yes
4	division	yes	yes	yes	yes	yes	yes
5	domestic/international	yes	yes	yes	yes	yes	yes
6	full-time/part-time	yes	yes	yes	yes	yes	yes
7	campus	yes	yes	yes	yes	yes	yes
8	year level	yes	yes	yes	yes	yes	no
9	degree type aggregate	yes	yes	yes	yes	no	no
10	sector	yes	yes	yes	no	no	no
11	department	yes	yes	no	no	no	no
12	degree type	yes	no	no	no	no	no
13	% in funded cohort	yes	yes	yes	yes	yes	yes

The degree type table contains the most detail, while the campus table contains the least. The rate used is the first available as one moves up the hierarchy. For example, if there is no rate available at the degree type level of the hierarchy, the next one to check is department, and so on, up to and including campus. The targets are then split into a yes array and no array. The yes array is the target multiplied by the rate of BIU eligibility, followed by rounding. The no array is the target minus the yes array. The files are then split, with the targets set equal to either the yes or no array, depending on the file. The resulting split files are then combined, and saved as

**imputed\_funded\_cohort.sav** as follows with the following column layout. All intermediate files are deleted.

```
t unit division forpos ftptrgst campus degree_type_aggregate  
sector department degree_type dom_intl yr1vl new feecattx hl_fee  
campus_incidental funded_cohort t1 TO t20
```

*Course Band (course\_band)*

On May 20, 2009, the University of Toronto Governing Council approved charging a program fee to all new incoming fall 2009 undergraduate FAS students based on their full-time part-time status with the stipulation that the program fee in 2009-10 and 2010-11 in a given term be charged to students taking four or more half courses, despite the full-time definition of three. Beginning in 2011-12, program fees would be charged based on the full-time part-time definition. In order to build this change into the model, a new data element called course band was introduced. The data element is set equal to zero initially, and is set to one if students take between 3 and less than 4 courses in a given term. They are shown in the table below:

**TABLE 16: Course Band Rate Tables**

Order	Column	Degree Type Table	Dept Table	Sector Table	Degree Type Aggregate Table	Year Level Table	Campus Table
1	intake_mode	yes	yes	yes	yes	yes	yes
2	term	yes	yes	yes	yes	yes	yes
3	unit	yes	yes	yes	yes	yes	yes
4	division	yes	yes	yes	yes	yes	yes
5	domestic/international	yes	yes	yes	yes	yes	yes
6	full-time/part-time	yes	yes	yes	yes	yes	yes
7	campus	yes	yes	yes	yes	yes	yes
8	year level	yes	yes	yes	yes	yes	no
9	degree type aggregate	yes	yes	yes	yes	no	no
10	sector	yes	yes	yes	no	no	no
11	department	yes	yes	no	no	no	no
12	degree type	yes	no	no	no	no	no
13	% within course band	yes	yes	yes	yes	yes	yes

The course band data element is also used to track first-year doctoral students who obtained direct entry into the PhD program from a bachelor program. These students are funded by MTCU at the masters weight. The fifth step follows the same method as the fourth program, and the output column layout is as follows:

```
t unit division forpos ftptrgst campus degree_type_aggregate
sector department degree_type dom_intl yrlvl new feecattx hl_fee
campus_incidental funded_cohort course_band t1 TO t20
```

*Campus Incidental*

In FAS, graduate students are allowed to affiliate with a particular campus through consultation with their department. For example, if a graduate student is supervised by a professor at the Mississauga campus, he/she may choose to affiliate with that campus in particular. Since the incidental fees are lower at Mississauga and

Scarborough, an economic incentive also exists to affiliate if one can save money in doing so. In ROSI, this data element is called associated organization (assoc\_org\_cd).

The third step takes the **imputed\_course\_band.sav** and matches it with a series of tables containing the rate of Mississauga campus affiliation and the rate of

Scarborough campus affiliation. These tables contain various level of detail as follows;

(i) campus\_degree\_type, (ii) campus\_department.sav, (iii) campus\_sector, (iv)

campus\_degree\_type\_aggregate, (v) campus\_yrlvl, and (vi) campus\_campus. They are

shown in the table below:

**TABLE 17: Campus Incidental Tables**

Order	Column	Degree Type Table	Dept Table	Sector Table	Degree Type Aggregate Table	Year Level Table	Campus Table
1	intake_mode	yes	yes	yes	yes	yes	yes
2	term	yes	yes	yes	yes	yes	yes
3	unit	yes	yes	yes	yes	yes	yes
4	division	yes	yes	yes	yes	yes	yes
5	domestic/international	yes	yes	yes	yes	yes	yes
6	full-time/part-time	yes	yes	yes	yes	yes	yes
7	campus	yes	yes	yes	yes	yes	yes
8	year level	yes	yes	yes	yes	yes	no
9	degree type aggregate	yes	yes	yes	yes	no	no
10	sector	yes	yes	yes	no	no	no
11	department	yes	yes	no	no	no	no
12	degree type	yes	no	no	no	no	no
13	% at St. George	yes	yes	yes	yes	yes	yes
14	% at Mississauga	yes	yes	yes	yes	yes	yes
15	% at Scarborough	yes	yes	yes	yes	yes	yes

The first rates found as one moves up the hierarchy of detail are the ones used for both Mississauga (miss) and Scarborough (scar). The target array is then copied and saved as miss and scar. The rates are applied to miss and scar respectively, followed by rounding. The miss and scar arrays are subtracted from the target array to obtain the St. George headcount. Each set of campus data is then stored in its own file with targets set to Mississauga, Scarborough, or St. George, depending on the file. The files are then combined and stored as **imputed\_campus.sav** with the following column layout.

```
t unit division forpos ftptrgst campus degree_type_aggregate
sector department degree_type dom_intl yrlvl new feecattx hl_fee
campus_incidental t1 TO t20
```

### *Regtype*

For consistency with other portions of the model, it is assumed that for targets to be met, all of the students in the targets must be registered. The purpose of this field is to match the targets to the extract, which is described in detail in chapter four. The data element regtype is set to 1 and **imputed.sav** is saved with the following column layout:

```
t unit division forpos campus dom_intl ftptrgst yrlvl
degree_type_aggregate sector department degree_type feecattx
hl_fee new campus_incidental funded_cohort course_band regtype t1
TO t20
```

All preliminary files associated with this section are deleted.

### **Input 3 – Financial Cancel (FINCA) and Cancellation (CANC) Table**

#### *Introduction*

Financial Cancel (also known as finca) is a process at the University of Toronto by which student course registrations are deleted from the student administration system (ROSI) if they have not registered within a prescribed time limit. Registration occurs when a student pays the tuition fee deposit, which is the amount of money required from admitted candidates, in order to hold a place in the program of study. This procedure is run automatically each term on prescribed dates, and involves changing students' registration status from "invited" to "finca". When a student record is "finca'ed", all of their course activities are deleted.

The finca dates typically vary by campus and division. In fall 2007, the dates were as follows: Scarborough (Aug 30), Mississauga (Sept 5), FAS, Physical Education & Health, Music, and Woodsworth College at St. George campus (Sept 19), School of Graduate Studies (Sept 24), all other divisions at St. George campus (Oct 9).

In some rare cases, graduate students taking courses end up being "finca'ed" because for whatever reason, they didn't pay their fee deposit. If these students then pay, they are switched back to a registered status. This can happen when a graduate student is awaiting a scholarship, and has not applied for a fee deferral, and can not pay his or her tuition out of pocket. In other cases, graduate students who are admitted to the fall term under strict conditions, but fail to meet those conditions, are finca'ed in late July.

### *Finca Data Extract*

The first and step is to extract two registration tables from ROSI in the format illustrated in Appendix 31 (Finca Registration Table). The difference in the two tables is that one selects all records in the SIS.NCAN table (not Canadian citizens table), the other selects all records that do not exist in the SIS.NCAN table (Canadian citizens). The reason for this is a convention in ROSI in which the SIS.NCAN table only stores citizenship and legal status information for non-Canadian persons (international students). If a student is not present in the SIS.NCAN table, they are assumed to be domestic. Once obtained, the tables are stacked on top of one another with data element names converted to lower case. The table is then saved as **finca\_reg.sav** with the following column layout across the rows:

```
reg_sts_eff_dt reg_sts_cd session_cd person_id applicant_type  
last_name first_name attendance_class year_of_study leg_status  
over_reg_fee_cat primary_org_cd second_org_cd co_sec_org_cd  
assoc_org_cd post_cd fee_post_subj_cd1 fee_tuit_fee_post_grp  
type_of_program formula_post_cat exchange_id
```

Returning students usually sign up for subject areas (subject posts) in the session after they have completed 4.0 FCE. FCE means full-course equivalent 1.0 weight (for example, one full weight course, for example, ANT100Y1, or two half courses, CSC108H1 and CSC148H1 together). Non-degree students do not select subject posts, unless they have a previous degree, but stay enrolled as specials. Certificate and Diploma students from Woodsworth college programs do not have subject posts as their degree post specifies their area of study. Students can have different statuses in subject posts. These include the following: active (ACT) where the subject post is in progress; complete (CMP) where the subject post has been completed; requested (REQ) means the subject

post is a restricted one to which the student has requested entry to; invited (INV) means the student has been invited to join a restricted subject post, and needs to confirm the invitation before being marked as active; refused (REF) means that the student's request for entry to a restricted subject post has been refused.

The second step is to extract subject post data directly from ROSI as illustrated in Appendix 32 (Subject Post Table). Only subject posts with student statuses of CMP, ACT, or INV are included. A data element called **subject\_post\_count** tracks the number of subject posts per student with up to nine being allowed in ROSI. In addition, the start and end of each subject post are included. The data are then re-packaged in a third step that eliminates blank rows and display the subject posts, their start, and end sessions across a row. The output is stored in a file called **finca\_subject\_post.sav** with the following column layout:

```
person_id subject_post_cd1 TO subject_post_cd10  
session_start1 TO session_start10 session_end1 TO session_end10
```

### *Finca Table Creation*

The fourth step links the **finca\_reg.sav** and **finca\_subject\_post.sav** tables. Subject posts that begin after the current session are coded to blank. The blanks are then replaced with subject posts to the right if they exist as a means of arranging subject posts sequentially. The fifth step removes the finca record in dual registrations where one record is registered and the other is finca'ed. In the case of dual records where they both have the same registration status, they are sorted in reverse alphabetical order, and one record is eliminated. The sixth step is to run data harmonization, and remove inactive students. Finally, the seventh step defines three data elements namely; **count\_reg**

(counts the number of registered students), **count\_finca** (counts the number of finca'ed students), and **count\_cancel** (counts the number of cancelled registrations). Since the data span a few years dating back to summer 2006, the critical week that the count would have be run is obtained by matching the term in the data with the **week\_count** table that contains future count dates to 2019-20. For example, in some years, the fall count date could be either week 44 or 45. The final table is stored as **financial\_cancel.sav** spanning all three terms with the following column layout across the rows:

```
t unit division campus dom_intl ftptrgst yrlvl  
degree_type_aggregate sector department degree_type week_count  
week_reg  
count_reg count_finca count_cancel count_total
```

## **Input 4 – FAS Past Undergraduate Commerce Pre-requisites**

### *Introduction*

In FAS at the University of Toronto, Commerce students typically enter the Commerce program in second year. Other institutions allow their students to enter Commerce in first-year. In order to claim BIUs for first-year Commerce students, the presence of certain combinations of the following courses must be checked for in the table below:

**TABLE 18 – Commerce Critical Courses**

Course	Description
COM100	Introduction to Commerce
RSM100	Introduction to Management
MGT120	Financial Accounting I
MGM101	Introduction to Management
MGTA02	Introduction to Management
MGTA03	Introduction to Management I
MGTA04	Introduction to Management II
ECO100	Introduction to Economics
ECMA02	Introduction to Economics: Math Approach
ECMA04	Introduction to Economics: Math Approach
ECMA06	Introduction to Economics: Math Approach
MAT112	Calculus
MAT123	Calculus & Linear Algebra for Commerce
MAT124	Calculus & Linear Algebra for Commerce
MAT125	Calculus for Science
MAT126	Calculus for Science
MAT132	Calculus
MAT133	Calculus & Linear Algebra for Commerce
MAT135	Calculus for Science
MAT136	Calculus & Foundations
MAT138	Calculus
MAT157	Analysis I
MATA27	Techniques of Calculus
MATA30	Calculus I
MATA32	Calculus for Management I
MATA33	Calculus for Management II
MATA35	Calculus II for Biological Science
MATA36	Calculus II for Physical Science
MATA37	Calculus II for Mathematical Sci

The course combinations necessary to be able to claim BIUs for Commerce are explained in further detail later in this thesis.

### *Creation of the Past Course Table*

The critical courses are obtained from ROSI through a series of steps. The first step reads the data in from ROSI. The selection criteria include students who have a mark or they have a deferred standing, or the mark has not yet been approved in one of the critical courses. The logic behind the mark approval is that ROSI assumes a student currently taking the course will end up passing it, and thus will get included as a Commerce student even if he/she hasn't technically finished the course (for example, has not definitively failed the course). Past data are stored locally, so the query only needs to be run for the current year at most.

The second step arranges the data such that there is one student record for each degree type with up to 15 courses across a row. The third step counts the past and present courses, and keeps a tally of the number of economics, commerce, and mathematics courses. The data are saved in a table **com\_yr1\_req\_past.sav** with the following column layout for use in the extract:

```
person_id eco_req_past com_req_past mgt_req_past mat_req_past
```

## **Input 5 – The FAS Extract**

### *Introduction*

The purpose of the extract is to allow the FAS to be able to anticipate what the fall count will be. This count anticipation is necessary so that graduate departments can know in advance whether or not they are going to meet targets. This knowledge is important for two reasons; the first is that such information helps departments take remedial action ahead of time if they are not going to meet targets. This remedial action can involve admitting more students prior to the start of the fall term or making budget cuts. The current P&B enrolment and revenue models were unable to assist departments because they lacked the detail at the departmental level. The second reason is that FAS made a policy decision in 2006 to transfer some of the graduate expansion funds to departments as an incentive for attracting BIU eligible students over and above their 2004-05 actual. This policy initiative made department chairs more interested in the anticipation of their departmental revenue.

The extract is run from July 1st to November 15th, and comprises a weekly dataset consisting of registration data, subject post data, and course data for all potential FAS St. George students. The extract for a given fiscal year contains all terms (summer, fall, and winter). For example, the 2007-08 extract consists of summer 2007, fall 2007, and winter 2008.

The extract then becomes an input to the FAS master file program, which determines BIU-eligibility for government funding. This is done by obtaining cumulative BIUs and checking for BIU maximization for each student record. Finally, a computer program takes the master file as an input, and applies a weekly “finca” rate to the records,

and anticipates the fall count as of November 1st. The estimation of summer headcount, winter headcount, FFTE, BIU, tuition, and grant are computed in the model and will be explained later.

### *PART A – The Extract Process*

#### *Creation of the FAS Extract*

A computer program was developed by Student Information Systems (SIS) at the university in consultation with FAS to produce four text files in the format illustrated in Appendix 51 through 54. This program is run weekly between July 1st and November 15th of an upcoming fall term. The files are then transported, and saved in an extract directory through an automated procedure. The files include *rosimtcu.txt* (containing student registration data and MTCU data elements), *subjpost.txt* (subject post data), *activity.txt* (course data), and *bius.txt* (cumulative BIU data). The first three programs (*sis\_rosimtcu.sps*, *sis\_subjpost.sps*, *sis\_activity.sps*) read the three tables into SPSS by applying a text file mapping as illustrated in Appendix 51 through 53. Once in SPSS, each table is saved along with the necessary data elements for further processing. The fourth program *sis\_merge.sps* takes the first table and matches it with the second and third, producing the following column layout:

```

session_cd sess person_id grad_funding_ind post_cd leg_status
citizen_country_cd fee_category reg_fee_cat status_lvl gender
birth_dt marital_sts mother_tongue surname given_name country
province county postal_cd session_lvl applicant_type
type_of_program primary_org_cd assoc_org_cd exchange_id
exchange_in_out_cd attendance_class level_of_instr year_of_study
second_org_cd co_sec_org_cd formula_post_cat latest_gpa
science_credits
senior_credits reg_sts_cd curr_cand_sts_cd candidacy_sess_cd
reg_sts_eff_dt reg_sts_dt over_reg_fee_cat other_post_cd
other_attendance_class tuition_amt exmp_reason_cd
fee_tuit_fee_post_grp fee_post_subj_cd1 post_mcu_fund_ind
full_cost_rec_ind tuition_amt extract_dt
subject_post_cd1 TO subject_post_cd4
field_of_study1 TO field_of_study4
designation_cd11 TO designation_cd14
acad_act_cd1 TO acad_act_cd15
section_cd1 TO section_cd15
full_cour_equiv_wt1 TO full_cour_equiv_wt15
credit_ind1 TO credit_ind15
acad_act_fund_ind1 TO acad_act_fund_ind15
status_eff_dt1 TO status_eff_dt15
reg_acad_act_dt1 TO reg_acad_act_dt15
credits1 TO credits15

```

Basically, each student record allows for up to 4 subject posts and 15 courses which account for 117 of the 180 data elements. Most students typically take 5 courses in a fall term, but in 2007, one student at one point had 11 courses selected, which prompted the rationale for allowing 15 courses per student. All of the data elements above are used except for gender, birth day, marital status, mother tongue, country, province, county, postal code, and tuition amount paid. These data elements are kept in anticipation of future projects in FAS. Appendix 55 illustrates the data elements above with their definitions for quick reference.

### *Edit Programs*

This next section contains a series of 21 computer programs that edit the data by excluding and re-coding some of the data records in order to harmonize the data for compatibility with other inputs, as well as replicate the process SIS goes through in getting the MTCU count submission ready. The first program “extract\_1\_active\_initialize.sps” defines a data element called “active” and sets it to “yes” for all records. This data element indicates whether or not a student record would be included in the count submission. The second program (extract\_2\_fee\_category.sps) initializes a data element called fee category. Students are coded to either BIU eligible or ineligible based on the criteria described earlier in this thesis.

The third program (extract\_3\_confirmed.sps) creates a data element called “confirmed” that tracks whether a student has an offer of admission denoted by “A” or a confirmation “O” that they are in fact coming to the University of Toronto. The fourth program (extract\_4\_candidacy\_sess\_cd.sps) defines two data elements **entry year** and **entry term** to store the term and year the student started his/her program.

The fifth program (extract\_5\_sessional\_dates.sps) consists of a set of assumptions described below, based on the relationship between the current time and drop/fee payment deadline dates. The first assumption is that time is measured in weeks since the extract is run on a weekly basis. The second assumption is that if an undergraduate student has not paid any tuition fees by week 38 (late September), he/she will not be attending the university. The third assumption is that an undergraduate student has not selected a course by week 39 (early October), regardless of whether he/she has paid tuition, will not be attending the institution in the fall. The students who fail these checks

are considered to be inactive records, and are removed from the population. The same assumptions are in place for graduate students in the fall, except the cut off week is two weeks later. Similar assumptions are in place for the summer and winter terms.

The sixth program (extract\_6\_active\_students.sps) checks for dual registrations where students are simultaneously registered in both a doctoral and masters program, and sets the masters record to inactive. In addition, visiting graduate students and graduate postdoctoral fellows are set to inactive as they do not pay tuition, and are not BIU eligible. Incoming exchange students are set to inactive as they pay tuition fees at their home institution, and are not BIU eligible. The inactive records are then removed from the population. The model does not model graduate postdoctoral fellows or visiting graduate students. The seventh program (extract\_7\_pey\_courses.sps) checks to see if students are only taking the Professional Experience Year (PEY). If they are, they are set to inactive, and excluded from the population. PEY students are not physically at the university as they do not pay tuition fees, but pay the placement fee, and the part-time incidental fee.

The eighth program (extract\_8\_crs\_count.sps) involves counting the full-course equivalents (FCE) for the purpose of calculating the FFTEs. FFTEs are calculated by dividing the FCE by the normal course load undergraduate level. Since the model spans three terms, this calculation is done for each term. For example, suppose a student attended the fall, winter, and summer. Suppose he/she took 1.0 FCE that spanned two terms, and 1.0 FCE that spanned the summer. Suppose the normal workload is 5.0. The calculation is illustrated in the following table for each term:

**TABLE 19: FCE Calculation**

Term	Calculation
Fall	$FFTE = (1.0 \text{ FCE} \div 5.0 \text{ normal load}) \div 2 \text{ terms} = 0.100$
Winter	$FFTE = (1.0 \text{ FCE} \div 5.0 \text{ normal load}) \div 2 \text{ terms} = 0.100$
Summer	$FFTE = (1.0 \text{ FCE} \div 5.0 \text{ normal load}) \div 1 \text{ term} = 0.100$

At the graduate level, full-time students generate 1.000 FFTE and part-time students generate 0.300 FFTE regardless of the number FCE they are enrolled in.

The ninth program (extract\_9\_duplicate\_handling.sps) is a check for duplicates within the same ministry program category. If this check finds such duplicates, a department may need to be contacted for clarification. An example would be two Geography records in ROSI where one is a masters program, and the other is a professional masters. If both records have the same ministry program category, the record with the most current registration status effective date is selected.

The 10<sup>th</sup> program (extract\_10\_new.sps) sets graduate students to “new” if their status level is 1. Undergraduates are set to “new” if the year associated with their candidacy status is the same as the current year. The definitions of status level and candidacy status are provided in Appendix 51.

The 11<sup>th</sup> program overrides the undergraduate attendance class of full/part-time in a term. At the university, students are full-time if they are taking 3.0 FCE; part-time otherwise. In FAS, the only exception is Woodsworth College, where the full-time threshold is 4.0 FCE. Prior to 2003-04, the threshold for FAS was 4.0 FCE for a full-time status, but that changed to comply with the federal and provincial governments’ definition of full-time study for education tax credits and student aid.

The next few computer programs take various tallies of student activity. The purpose of counting these items is to apply an algorithm that assigns the undergraduate

ministry program categories (arts general, arts honours, commerce, science general, science honours) for the purpose of replicating how BIU weights are assigned to student records in the MTCU count. Where multiple student activities exist, a hierarchy is applied to them such to yield the maximum BIU weight possible, thus generating more operating grant for the institution. The 12<sup>th</sup> program (extract\_12\_asc\_pgm\_counters.sps) counts all of the specialist programs, majors, minors, and commerce subject posts for each student. Specialist programs are programs where a student specializes in a certain subject area (for example, economics specialist), and has to complete certain courses to qualify. Majors are similar to a specialist, but fewer upper-year courses are required to obtain the major. Minors can typically be obtained by taking a prescribed combination of first and second year courses (for example, a bachelor degree with a major in economics, a minor in mathematics). The 13<sup>th</sup> and 14<sup>th</sup> programs (extract\_13\_asc\_pgm\_count\_com\_new.sps and extract\_14\_asc\_pgm\_count\_com\_past.sps) count the following past and present economics, commerce, management, and mathematics courses for each first-year student, for the purpose of determining whether the students can be claimed to the ministry as commerce students. The 15<sup>th</sup> program (extract\_15\_asc\_pgm\_count\_com\_tally.sps) tallies the past and present course combinations (full list of past and present courses in appendix). The 16<sup>th</sup> program (extract\_16\_asc\_lower\_stream.sps) sets the student stream (arts, science, or commerce) based on the program of study for first-year students. This program also looks at the session level, term, and specific course counts in economics, commerce, management, and mathematics for setting first-year Commerce. The algorithm is structured as a series of cases where once moves down a hierarchy of cases

until arts, science, or commerce are set. If at the end of the cases, the stream remains unassigned, it is set to arts. For further details, the actual SPSS source code should be consulted. The 17<sup>th</sup> program (extract\_17\_asc\_upper\_stream.sps) goes through a similar process as the 16<sup>th</sup> to set a stream for upper year students.

At the undergraduate level, there are general bachelor degrees (three years in duration) and honours bachelor degrees (four years in duration). Starting in summer 2001, the general bachelor degrees were phased out, and students could only enter honours programs after first-year. From a government operating grant perspective, the MTCU continues to fund all first-year students and all special students as general, while it allows upper-year students to be either general or honours. In fall 2007, there were 98 full-time and 277 part-time general bachelor students in upper years with the vast majority of them in years three and four. By fall 2010, assuming a 50 percent decline per year due to graduation and students under the old system upgrading to honours, there should be 12 full-time and 34 part-time students remaining. The 18<sup>th</sup> program (extract\_18\_asc\_pgm.sps) determines whether students are honours or general. This only applies to upper year students with either an arts or science stream set in programs 16 and 17. All upper-year students who began their studies at the university in or beyond summer 2001 are coded as honours. All first-year students and all special students are coded to general regardless of when they began their studies. As a caveat in ROSI, program of study codes that end with a “U” indicate a student is upgrading to an honours bachelor degree. All of these students are coded as honours regardless of when they started.

The remaining population not coded above is upper year students who started at U of T prior to summer 2001. Four tests are done to indicate whether they are pursuing a general or honours bachelor degree. The first is the GPA test which codes students to general if their GPA is below 1.85, and honours otherwise. The second test takes the general bachelor group produced by the first and looks at the subject post. If they have one or more specialist, two or more majors, one major and two minors, or three minors, they are coded to honours, with the rest remaining as general. The third and fourth test take the general population produced by the second and classify students as honours based on the number of senior and / or science credits they have. Further details are available in the SPSS source code. The 19<sup>th</sup> program (extract\_19\_forpos.sps) looks at the stream and type of bachelor degree and assigns the ministry program category.

#### *FAS Dual Registrations*

The MTCU does not allow institutions to submit two full-time records for funding. The record that generates the highest BIU weight is the one claimed (MTCU, 2000, p. 2.8) as full-time. The other record is re-coded to part-time. The 20<sup>th</sup> program (extract\_20\_dual\_reg.sps) looks at dual registrations where one record is a graduate FAS record, and the other is an undergraduate (for example, law or education). In all cases, the graduate FAS record maximizes BIU, and is claimed as full-time. The other record is re-coded to part-time.

### *Legal Status Check*

The 21<sup>st</sup> program (extract\_21\_check\_leg\_status.sps) performs a check to ensure there are no domestic students paying international fees due to data entry errors or vice versa. Records with potential errors are brought to the attention of the undergraduate and graduate registrars. A secondary check identifies international exchange students paying domestic fees. These records are brought to the attention of the registrars to ensure they are legitimate entries. In order for an exchange student to be waived international fees, the exchange program must be BIU eligible for operating grant funding. Exchange students who do not pay any tuition fees are inactive as well is BIU ineligible.

### *Final Extract File*

The data harmonization program that was run for the count is now run for the extract. The output is saved, and used as an input for the master file.

## *PART B – The Master File Stage*

### *Extraction of BIU table*

The purpose of the master file is to determine the formula funding eligibility of graduate student records based on whether or not they have maximized BIUs. In ROSI, a table called SIS.BIUS keeps track of master and doctoral students' cumulative BIUs. Special graduate students, graduate diploma students (for example, gerontology diploma), and exchange students are not recorded in the table. A few weeks after the MTCU count and audit submissions are complete, they are checked to ensure the BIU transactions that were created with the count file are correct and complete. They then ensure that a back-up copy of the SIS.BIUS table is created by running a quick query and saving the data. Next, they update the SIS.BIUS table through a function in ROSI. If there are any errors, these are corrected directly to SIS.BIUS table by another ROSI function.

The latest BIU table (biu.txt) is read using a computer program. Since the BIU table tracks cumulative BIUs claimed for masters and doctoral students under a given ministry program category, students who completed both at the university will have two records. In addition, the doctoral record includes BIUs claimed as a masters student. As a result, the doctoral record is always selected as it contains the cumulative BIU to date. If a student has a masters record and doctoral record under different formula post categories, both records are selected. This selection is done by a computer program that also records the last session in which the table was updated in a data element called **table\_last\_update**. The table is saved as **sis\_bius.sav** with the following column layout:

```
extract_dt unit person_id formula_post_cat cbius claim_status  
record_last_update table_last_update
```

### *Estimation of Future BIUs*

Since the extract contains the data for the upcoming fiscal year (summer, fall, winter), the winter MTCU count of the existing year must be finalized and released by P&B before any estimation can occur. If the ministry is satisfied with the MTCU count submission, P&B can release the data. However, if they are not, P&B must fix any errors within a prescribed time limit. Upon completion, they would have to re-submit either a subset of corrected records, or in a worst case, the entire MTCU count. The reason for the finalization is that once the extract for the upcoming year is run it overwrites last fiscal year's extract. In addition, upper year graduate records do not get rolled over to the next fiscal year until the last week in May, so attempting to pull an extract before that time would only obtain first-year graduate students. Upon finalization of the MTCU count, FAS receives a copy and updates the count file and count tables with the addition of the new data.

There is a lag of a few months on average between the time the MTCU count is finalized, and the corresponding BIU table is updated in ROSI. As a result, the BIU table is one term behind the count file and corresponding count tables during a portion of this period. In order to handle this, BIU anticipation tables are produced for different cases. These tables store the incremental BIUs, associated with a term. From the count file, the latest winter and summer BIUs tables were already generated as part of the first input described in this thesis. The first computer program (`master_1_incremental_biu.sps`) obtains the BIUs associated with the summer, fall, and winter term in the extract for the upcoming year. The second program (`master_2_combine.sps`) takes the existing BIU table and matches it to both the winter and summer BIUs from the count table, along with

the summer, fall, and winter BIUs from the extract. Two data elements (count\_session, sisbius\_session) store the sessions that the count and SIS.BIUS tables were last updated.

The third program (master\_3\_biu\_tally\_start\_of\_term.sps) calculates the cumulative BIUs for the summer, fall, and winter terms in the extract prior to the start of the term in the extract. The fourth program (master\_4\_biu\_tally\_end\_of\_term.sps) calculates the cumulative BIUs for the summer, fall, and winter terms in the extract as of the end of the term. Both the third and fourth program go through a series of cases to tally the respective BIUs. For further details, please consult the SPSS source code and comments to view the cases.

### *BIU Eligibility*

The fifth program (master\_5\_feeecat\_initialize.sps) initializes a data element called feeecat which is set initially to the fee category that was set in the extract described earlier in this chapter. If the cumulative BIUs exceed the BIU maximum described earlier in this thesis, feeecat is set to 1 (ineligible). For graduate students, the 6<sup>th</sup> program (master\_6\_feeecat\_override.sps) adjusts the BIU for eligible students who only accumulate a portion of BIU because they exceed the maximum by the end of the term. For example, if a full-time doctoral student had 26 cumulative BIUs at the start of the fall term, this individual would normally accumulate 2, but since 27 is the maximum, the student would only accumulate 1 BIU. Finally, the 7<sup>th</sup> program (master\_7\_feeecatx.sps) assigns a data element called feeecatx which stores the “the text meaning of fee category”, which is either eligible or ineligible.

### *Final Master File*

The master file is then saved and used as an input to the after finca program, which creates a headcount, FFTE, and BIU table to be used in the model.

### *PART C – The After Finca File*

In this section, “finca” and cancellation tables are generated from the **finca\_cancel.sav** file, created earlier in this thesis. When students are given an offer of admission, they are entered in ROSI as an “invite”. As time goes on, they will register by paying the minimum tuition to register, be “finca’ed” by not registering, or register then cancel. The “finca” rates are applied to the invited population, and the cancellation rates to the registered population. Over time, the invited population approaches zero, as students either register, cancel, or are “finca’ed”. Appendix 57 illustrates the registration behaviour by FT domestic graduate students over the past two fall terms.

*Finca and Cancellation Table Methodologies*

The financial cancel table **financial\_cancel.sav** produced earlier in this thesis is split into several tables with varying levels of detail, with the finca and cancellation rates re-calculated for each table, each time an FAS extract and master file are created. This is illustrated below:

**TABLE 20: Finca and Cancellation Rate Table Nesting**

Order	Column	Degree Type Table	Dept Table	Sector Table	Degree Type Aggregate Table	Year of Study Table	FT/PT Table	Dom / Int'l Table
1	term	yes	yes	yes	yes	yes	yes	yes
2	unit	yes	yes	yes	yes	yes	yes	yes
3	division	yes	yes	yes	yes	yes	yes	yes
4	campus	yes	yes	yes	yes	yes	yes	yes
5	domestic / international	yes	yes	yes	yes	yes	yes	yes
6	full-time/part-time	yes	yes	yes	yes	yes	yes	no
7	year of study	yes	yes	yes	yes	yes	no	no
8	degree type aggregate	yes	yes	yes	yes	no	no	no
9	sector	yes	yes	yes	no	no	no	no
10	department	yes	yes	no	no	no	no	no
11	degree type	yes	no	no	no	no	no	no
12	finca/canc rates	yes	yes	yes	Yes	yes	yes	yes

The rationale for producing these sub-tables is so new programs, are assigned with both “finca” rate and cancellation rate, where only higher level detail are available. For example, if a new program is starting in the upcoming fall, it will likely appear in the FAS extract and master file, but will not appear in the “finca” data based on history. In the absence of degree type “finca” rates, departmental or sectoral would be applied. If the new program is a new department and degree type, sectoral “finca” rates would apply. The column layout of these tables is available in Appendix 56. Records included in the

“finca” rate calculation are those between the present (the week associated with the latest extract run) and the count date for a given term. For example, suppose the extract was run the week of Sept 1 (week 36 in 2009) and the count date is Nov 1 (week 44 in 2009) for the fall term. All student records between weeks 36 and 44 inclusive will enter into the “finca” rate calculations. Records used in the cancellation rates calculation include those cancellations between now and the count date. If the registration date falls before the present, those cancelled records are excluded from the total population and are zeroed out. For example, suppose the extract is run the week of Oct 15 (Week 42 in 2009) and the count date is Nov 1 (week 44 in 2009). In addition, there are 100 records and 10 cancellations throughout the term. If 9 cancellations occurred before week 42, they are removed from the population to yield a 1.1 percent cancellation rate ( $1 \div 91$ ) between now and the count date. The logic is that the closer one gets to the count date, program drop dates will have long past, and most cancellations will have already occurred.

### *Justification for a Difference in Methodology between finca and cancellation rates*

The difference in methodologies for finca and cancellation rates are a result of the finca rates being applied to the invited population which ultimately disappears as one nears the count date. The cancellation rates are applied to the registered population, which does not disappear. In terms of the cancellation rate, if one applied it in the same fashion as the finca rate, the cancellation rate would approach 100 percent near the count date and zero out the registered students, which is not realistic. The rates are then applied to the headcounts, FFTEs, and BIUs. Three tables for each are saved and used as inputs to the model, which is explained in the next section.

### *Application of finca and Cancellation Rates to the Master File Headcount*

The master file is obtained, and a before finca matrix is created which is equal to the headcount for a given year, where bf[1] corresponds to 2000-01, bf[2] corresponds to 2001-02, and so on. The column layout is as follows:

```
t unit division forpos campus ftptrgst yrlvl dom_intl
degree_type_aggregate sector department degree_type feecattx
hl_fee new campus_incidental funded_cohort course_band regtype
week_count bf1 TO bf20
```

The master file is then matched with the finca tables created in the last chapter. These rates are then subtracted from one, and applied to the before finca headcounts above to obtain the after finca headcounts. The cancellation rate is calculated the same way. For example, if the finca rate is 20 percent, the after finca rate is 80 percent (100 percent minus 20 percent). The finca rate is applied to the invited population, the cancellation rate to the registered population. A data element called **regtype** (see

Appendix 55) keeps track of whether students are invited or registered. The output is saved as **after\_finca\_count.sav**. For the FFTEs and BIUs in the master file, the finca and cancellation rates are applied to before finca FFTEs and BIUs rather than to the full-time and part-time headcount. The subsequent files are saved as **after\_finca\_ffte.sav** and **after\_finca\_biu.sav**.

## **Input 6 – Tuition Fee Tables**

### *Introduction*

The Ontario Government has always regulated domestic tuition fee annual increases to some degree, with some program categories having more discretion than others in terms of how high the fees can increase. Under the current policy in 2009-10, the limit was 4.5 percent for domestic undergraduate FAS students. The limit for commerce was 8.0 percent for the same period. The FAS charges differential tuition fees based on the degree program the student is in. In addition, some programs charge program fees instead of course fees to all students taking at least three courses per term. Graduate program fees cover the fall, winter, and summer. For example, a MA student in economics would pay the entire program fee in the fall, and would not have to pay tuition until next fall.

Undergraduate and graduate tuition tables are used in the model for the purpose of assigning tuition fees to new and returning students. The standard tuition fees are stored in an Microsoft Excel spreadsheet called **tuition\_fee\_table.xls**. Standard tuition fees are the official fees set by the university. The sheet contains two tabs (undergraduate and graduate). Each tab contains the standard tuition fees since 2000-01 for both new and returning students, as well as whether a program fee was charged in that year for each type of student. The program fee data elements are binary with the values 0 for no and 1 for yes. These Microsoft Excel tables are updated manually to reflect the official university tuition fees from the FAS and School of Graduate Studies.

**TABLE 21: Tuition Input Column Layout**

Undergraduate Tab Column Layout	Graduate Tab Column Layout
unit hl_fee department yrlvl ugrd_tuition_new1 TO ugrd_tuition_new20 pgm_fee_new1 TO pgm_fee_new20 ugrd_tuition_ret1 TO ugrd_tuition_ret20 pgm_fee_ret1 TO pgm_fee_ret20 growth_ret growth_new	unit hl_fee department yrlvl ugrd_tuition_new1 TO ugrd_tuition_new20 pgm_fee_new1 TO pgm_fee_new20 ugrd_tuition_ret1 TO ugrd_tuition_ret20 pgm_fee_ret1 TO pgm_fee_ret20 growth_ret growth_new

*Projection of Tuition Fees*

There are two programs (one for undergraduate, one for graduate) that read the tuition fees into SPSS, and process the data (program\_tuition\_ugrd.sps and program\_tuition\_grad.sps). A data element called last\_tuition\_update is initialized, and used to determine the academic year in which the projections start. In 2009-10, tuition fees for new students are assumed to grow at 4.5 percent, while returning students' tuition fees grow at 4.0 percent. The university as well as the government have policies surrounding tuition fee increases (University of Toronto, 2009 4). The following table illustrates how tuition is projected.

**TABLE 22: Projection of Tuition Fees**

Year Level	Program Entry Year	Projection of Tuition Fee
1	1	Current tuition is last year's year 1 fee + growth rate for returning students
2	2	Current tuition is last year's year 1 fee + growth rate for returning students
2	2	Current tuition is last year's year 2 fee + growth rate for new students
2+	1 or 2	Current tuition is the fee for last year + growth rate for returning students

### *Final Table Layouts*

The undergraduate tuition table is then assigned a data element called **new** (0 for returning; 1 for new) and the file is re-packaged and saved with the following column layout for use in the model:

```
unit hl_fee new department yrlvl ugrd_tuition_update  
ugrd_tuition1 TO ugrd_tuition20 pgm_fee1 TO pgm_fee20
```

The graduate tuition table is then assigned a data element called **new** (0 for returning; 1 for new) and the file is re-packaged and saved with the following column layout for use in the model:

```
unit hl_fee new department yrlvl grad_tuition_update  
grad_tuition1 TO grad_tuition20 pgm_fee1 TO pgm_fee20
```

## Building The Model

### Introduction

A computer program called **model\_creation.sps** creates the model by running seven modules that will be explained in this chapter. The final output (model\_final.sav) consists of headcount, FFTE, BIU, grant, grant related deductions, tuition, and tuition related deductions for all three terms spanning all years from 2000-01 through 2019-20. The model was initially designed to stop projections at 2019-20, but this could be extended to coincide with the university's 2030 strategic plan. Actuals (**a1** to **a20**), Targets (**t1** to **t20**), Before Finca (**bf1** to **bf20**), and After Finca (**af1** to **af20**) values are stored in four arrays.

### Module 1 – Fall Headcount for Actuals, Targets, Before and After Finca

Since the targets for the model are expressed as fall headcounts, the first module combines the inputs for actuals, targets, before finca, and after finca, and saves it as model.sav with the following column layout. Other measures such as FFTEs are dealt with in further modules.

```
t unit division forpos campus dom_intl ftptrgst yrlvl  
degree_type_aggregate sector department degree_type feecatx  
hl_fee new campus_incidental funded_cohort course_band regtype a1  
TO a20, t1 TO t20, bf1 TO bf20, af1 TO af20
```

## Module 2 – Imputing Summer and Winter Targets

Since the target data only consist of fall, the other two terms need to be imputed. This is done by applying the winter over fall and summer over the previous fall rates to the fall targets in module 1. Since the fiscal year is a consecutive summer, fall, and winter, and the academic year is a consecutive fall, winter, and summer, the previous fall needs to be used for the summer over previous fall rates. The reason is that students flow-through in accordance with the academic year, but the model follows the fiscal year under the operating grant formula. This is illustrated in the table below. The summer 2008 falls under academic year 2007-08 and falls under fiscal year 2008-09.

**TABLE 23: Term Inclusion for Government Fiscal Year and Academic Year for 2007-08**

Year Type	Summer 2007	Fall 2007	Winter 2008	Summer 2008
Fiscal	yes	yes	yes	no
Academic	no	yes	yes	yes

The second module imputes the headcount for the summer and fall terms through four steps. The first step links the model to the summer and winter rate count tables at varying levels of detail to account for the lack of factors for new programs. Two data elements; summer over previous fall, and winter over fall, are initialized to the most detailed rates available. If a rate is not present, the model moves up a level of detail until a rate is found. The second step is an override designed to set a rate of zero for a term in which no students will exist. For example, when the masters in public policy was a new program, it did not behave like any other social sciences professional masters programs,

and only consisted of five consecutive terms. The override currently sets the summer over previous fall rate to zero for the first two years of the program. The override expired once enough historical data existed. The third and fourth steps involve generating the summer and winter terms respectively.

### **Module 3 – Headcount, FFTE, and BIU for all terms**

The third module completes the headcount, FFTE, and BIU through six steps. The first step combines the first two modules into one file and defines a new data element called **measures**. The column layout of the file is as follows:

```
measure unit division forpos yr1vl dom_intl degree_type_aggregate  
feecatx ftptrgst campus sector department degree_type t hl_fee  
new campus_incidental regtype  
a1 TO a20 t1 TO t20 bf1 TO bf20 af1 TO af20
```

The second step links the model to the average FFTE and BIU weights that were produced from the count file (see appendix 13). Two data elements **avg\_ffte** and **avg\_biu** are set to the lowest level of detail. If weights are missing, higher level detailed weights are used, with ineligible BIUs set to zero. If the average FFTE is still missing, the average FFTE is set to 1.000 for full-time graduate students and 0.300 for part-time graduate students. If the average BIU weight is missing, it is set equal to the average FFTE multiplied by the BIU weight associated with the ministry program category.

The third step applies the average FFTE weights to the target headcounts, and combines the targets with the actual, before finca, and after finca FFTEs that were generated during the count input and extract input chapters. The file is saved as **model\_ffte.sav**. The fourth step follows the same methodology as the third, and applies

the average BIU weights to the average FFTEs. The file is saved as **model\_biu.sav** with the measure data element set to BIU. The fifth step combines the three files and saves the output as **model.sav**. This new file now has three measures (N, FFTE, BIU). Finally, the sixth step obtains the year and term the projections start from count table **start.sav**. For example, a calculated year of 9 corresponds to 2008-09 and a calculated term of 1 corresponds to summer. For all past terms for which there are actuals, the targets, before finca, and after finca are set to the actuals. If the current fiscal year is the calculated year and the calculated term is greater than the current term, the targets, before finca, and after finca are set equal to the actuals. The file is then re-saved as **model.sav**.

#### **Module 4 – Additional Measures**

The 4th module computes inputs that are of interest to various users such as FAS department chairs, through the running of three programs. The first step takes as an input the **model.sav** file and selects the fall full-time headcount. The measure is then set to **FALL\_N\_FT** and the file is saved as **model\_measure\_fall\_n\_FT.sav**. The second step performs the same task as the first except for the fall part-time headcount. The third step takes as an input the **model.sav** file and selects the eligible FFTEs. The measure is then set to **EFFTE** and the file is saved as **measure\_efte.sav**. The fourth step takes the file **model.sav** and selects the fall FFTEs only. The measure is set to **FFFTE** and the file is saved as **measure\_ffte.sav**.

## **Module 5 – Basic Operating Grant**

The BIU value for the Ontario Basic Operating grant is defined by the MTCU. For example, it was \$5,110 in 2007-08. The effective BIU is generated by the university budget model, and takes into account the non-operating formula driven funds provided to the University of Toronto by the MTCU. In 2007-08, the effective BIU value was \$5,807.

This module takes the file `model.sav` created in the previous module, and calculates the components that make up the basic operating grant through the running of three programs. The first program (`grant_basic_1_boi.sps`) calculates the BOI using the BIU value and using the effective BIU value. The measures are set to “BIU\_VAL” and “BIU\_EFF”, with corresponding files saved as `model_grant_boi_val.sav` and `model_grant_boi_eff.sav`. The second program (`grant_basic_2_ffee.sps`) takes the file `model.sav`, selects the FFTEs, and applies the standard fee to them. For undergraduate students, the FAS standard fee per term is \$2,386. For graduate students, the standard fee is \$1,198 per term. The measure is set to “FFEE” and the file is saved as `model_grant_ffee.sav`. The third program (`grant_basic_3_final.sps`) takes the files produced by the second and third program, and subtracts the standard fee from the basic operating income. The measure is then set to “GRANT\_VAL” where the BIU value was used, and “GRANT\_EFF” where the effective BIU value was used. The files are then saved as `model_grant_final_val.sav` and `model_grant_final_eff.sav` respectively.

## **Module 6 – Tuition Calculation and Measures**

There are two types of tuition fees in FAS. These include program fees, which are charged to students regardless of the number of courses they are taking. Course fees are charged to students based on the number of courses they undertake. Currently, program fees are charged to all graduate students, and undergraduate FT years 2-4 commerce, computer science, and bioinformatics students. Course fees are charged to everyone else. Tuition growth rates are built directly into the tuition tables and are subject to change.

This module involves the running of 9 programs to calculate tuition fees. The first program (tuition\_1\_setup.sps) computes two tables. The first is the average fall winter headcount table and the second is the 3-term FFTE table. The files are saved as model\_tuition\_ffte.sav and model\_tuition\_navg.sav. The files are then merged and saved as model\_tuition\_setup.sav. The purpose of this initial step is to easily apply the right measure to students who pay program fees and students who pay course fees. The measure data element is set to 'NAVIG' and is referred to as the "tuition unit" which is analogous to the basic income unit on the grant side. The 3-term tuition unit is defined to be the average fall winter headcount for (a) undergraduate fall & winter full-time years 2 and up Commerce and Computer Science programs as well as those who are paying program fees in fall 2009 and beyond, for (b) all full-time graduate programs, and for (c) all part-time graduate programs multiplied by 0.300. FFTEs are used for all other full-time and part-time undergraduate programs. The Tuition Fee inputs are then multiplied by the tuition unit in the model for the different types of students.

The second program (tuition\_2\_gross\_linked.sps) links the undergraduate and graduate tuition table to model\_tuition\_navg.sav. The undergraduate and graduate tuition tables are kept separate as inputs since undergraduate tuition fees are charged by department (academic bridging, bioinformatics, commerce, computer science, CTEP, IFP, and other undergraduate) and graduate tuition fees are charged by degree type (doctoral, masters program, and professional masters programs). In addition to the tuition fees, the tuition tables keep track of whether program fees are charged through a series of 0's and 1's (0 = no; 1 = yes). The graduate tuition fees are all assumed to be program fees.

The third program (tuition\_3\_assumptions) takes the output from the second program and makes a few assumptions about the tuition fees. The first is that PT undergraduate students are charged course fees, the second is that graduate students do not pay tuition in the summer. The third is that PT graduate students pay 30 percent of the program fee. The fourth program (tuition\_4\_tuition\_ffte.sps) sets the tuition unit to average fall-winter headcount for students paying program fees and to 3-term ffte for those paying course fees. The fifth program (tuition\_5\_gross) applies tuition fees to the tuition units and saves the output (model\_tuition\_gross.sav) with the measure data element set to "TU\_GROSS".

Three factors are applied to tuition fees, and are provided by P&B. Uncollected fees write-off is the amount lost due to students not paying their fees. The assumption is 0.37 percent of undergraduate gross tuition and 0.32 percent of graduate gross tuition. Collection of fees in arrears is the amount collected due to students paying their past-due fees later. The assumption is 0.12 percent of undergraduate gross tuition and 0.47

percent of graduate gross tuition. The doctoral year 5 adjustment, also known as “doc 5” is an adjustment to fee revenue for doctoral students who complete degree requirements mid semester and receive a partial refund of fees. The assumption is 0.90 percent of gross doctoral tuition. The sixth program (tuition\_6\_uncoll.sps) takes the output from the fifth program and applies factors for the uncollected fees and saves it as **model\_tuition\_uncoll.sav** with the measure data element set to “TU\_UNCOLL”. The seventh program (tuition\_7\_coll.sps) takes the output from the fifth program and applies factors for the fees collected in arrears and saves it as model\_tuition\_coll.sav. The measure data element is set to “TU\_COLL”. The eighth program (tuition\_6\_doc5.sps) takes the output from the fifth program and applies factors for the DOC5 adjustment and saves it as model\_tuition\_doc5.sav and sets the measure data element to “TU\_DOC5”.

The factors used are summarized in the following table:

**TABLE 24: Deduction Factors used by P&B**

Factor	Undergraduate Percentage	Graduate Masters Percentage	Graduate Doctoral Percentage
Uncollected Fees	0.0037	0.0032	0.0032
Fees Collected in Arrears	0.0012	0.0047	0.0047
DOC5 Adjustment*	0.0000	0.0000	0.0090

*\* The DOC5 adjustment only applies to Doctoral students.*

The ninth program (tuition\_7\_final.sps) combines the outputs from the fifth through eighth. Tuition is equal to the gross tuition less uncollected fees, less doc 5, plus fees collected in arrears. The output is saved as (model\_tuition\_final.sav) with the measure data element set to “TUITION”. Tuition Final = (Gross Tuition – Uncollected Fees + Collection of Fees – Doc 5 Adjustment)

## **Module 7 – Total Tuition and Grant**

Three programs are run in this module to create a cube with all elements that are part of the grant and tuition calculation. The first program (revenue\_1\_total.sps) combines the output from the seventh program (model\_tuition\_final.sav) and the output from module 6 (model\_grant\_final\_val.sav and model\_grant\_final\_eff.sav). The combined file using the BIU value is assigned a measure of “TOTAL\_VAL” and is saved as (model\_total\_val.sav). The combined file using the effective BIU value is assigned a measure of “TOTAL\_EFF” and is saved as (model\_total\_eff.sav). The second program (revenue\_2\_consolodated.sps) takes the following files in the table below and stacks them on top of one another and saves the output as (model\_final.sav) to capture all parts of the grant and tuition calculation from the two different BIU perspectives. The third program (revenue\_3\_erase.sps) erases the preliminary files.

**TABLE 25: Measures Summary**

File	Measure	Description
model_grant_boi_val.sav	BOI_VAL	Basic Operating Income Value
model_grant_boi_val.sav	BOI EFF	Basic Operating Income Effective
model_grant_ffee.sav	FFEE	Standard fee
model_grant_final_val.sav	GRANT_VAL	Basic Operating Grant Value
model_grant_final_eff.sav	GRANT EFF	Basic Operating Grant Effective
model_measure_fall_n_FT.sav	FALL_N_FT	Fall FT Headcount
model_measure_fall_n_PT.sav	FALL_N_PT	Fall PT Headcount
model_measure_efte.sav	EFFTE	Eligible FFTE
model_measure_ffte.sav	FFFTE	Fall FFTE
model_tuition_navg.sav	NAVG	Tuition unit
model_tuition_gross.sav	GROSS	Gross Tuition Fees (\$)
model_tuition_uncoll.sav	UNCOLL	Uncollected Fees Provision(\$)
model_tuition_coll.sav	COLL	Collected Fees Provision(\$)
model_tuition_doc5.sav	DOC5	Doctoral Year 5 Adjustment (\$)
model_tuition_final.sav	TUITION	Tuition Less UNCOLL, COLL, and DOC5
model_total_val.sav	TOTAL_VAL	Grant Value + Tuition
model_total_eff.sav	TOTAL EFF	Grant Effective + Tuition

The final file (model\_final.sav) has the following column layout and forms the basis for the next section on output tables:

```
measure t unit division forpos campus sector department ftptrgst  
degree_type degree_type_aggregate dom_intl feecattx hl_fee yr1vl  
new campus_incidental funded_cohort course_band regtype t1 TO t20  
a1 TO a20 bf1 TO bf20 af1 TO af20
```

## **Output – Standard Reporting**

### *Monitoring Report (Graduate Students Only)*

#### *Introduction*

The monitoring report was designed as a result of the graduate expansion policy presented by the Ontario government in 2004-05. This policy allowed institutions to receive Basic Operating Grant for eligible FFTE growth over 2004-05. The program has an informal termination date of 2009-10, but no formal date has been provided.

#### *Purpose*

The purpose of the monitoring report is to track two kinds of eligible FFTE growth in graduate programs. The first is to compare the current fall actuals to the fall 2004 actuals to see which programs are not growing over their fall 2004 actuals. The second is to compare the current fall actuals to the current fall target to see which programs are not meeting their targets. Programs that fall under either case are known as “culprits” with negative growth in the first case being most serious as government funding could be forgone.

*Monitoring Report Column layout*

The monitoring report consists of four tables consisting of the following 15 columns with the most important columns being 1, 2, 3, 13, 14, and 15.

**TABLE 26: Monitoring Report Column Layout**

Column	Column Name	Description
1	Fall 2004 start	Fall 2004 actual FFTE
2	Fall 2008 Target	Fall 2008 target FFTE
3	Target minus Start	Column 2 minus column 1
4	BF Returning (REG)	Returning FFTEs who already paid tuition
5	BF Intake (REG)	New FFTEs who already paid tuition
6	BF Returning (INVIT)	Returning FFTEs who indicated they are coming to U of T but have not yet paid tuition
7	BF Intake (INVIT)	New FFTEs who indicated they are coming to U of T but have not yet paid tuition
8	BF Total	The sum of columns 4 to 7
9	AF Returning (REG)	Column 4 multiplied by the cancellation rate
10	AF Intake (REG)	Column 5 multiplied by the cancellation rate
11	AF Returning (INVIT)	Column 6 multiplied by the financial cancel rate (finca rate)
12	AF Intake (INVIT)	Column 7 multiplied by the financial cancel rate (finca rate)
13	AF Total	The sum of columns 9 to 12
14	AF Total minus Start	Column 13 minus column 1
15	AF Total minus Target	Column 13 minus column 2

*Monitoring Report Tables*

- 1) FAS St. George Graduate Fall Eligible FFTE by Degree Type
  - 2) FAS St. George Graduate Fall Eligible FFTE by Sector & Degree Type
  - 3) FAS St. George Graduate Fall Eligible FFTE by Dept & Degree Type
  - 4) FAS St. George Graduate Fall Eligible FFTE by Department\*
- \* for the purpose of allocating GAAs, internal Graduate expansion funds, and other awards

## *Monitoring Report Revenue (Graduate Students Only)*

### *Introduction*

Since the monitoring report only consists of a fall-to-fall FFTE comparison, it is important to calculate the 3-term revenue that is generated. All components of the revenue calculation such as deductions are shown.

### *Purpose*

The purpose of the revenue report is to show the 3-term revenue generated in 2004-05 and compare it to the latest after finca estimate for the current year. The third table shows the change in revenue over 2004-05. Detailed descriptions can be found in the BIU rules document.

**TABLE 27: Monitoring Report Revenue**

Column	Column Name
4	Fall FFTE
6	3-term FFTE
8	3-term BIU
9	Basic Operating Income (BOI)
10	Subtract Standard fee
11	Basic Operating Grant
12	Gross Tuition
13	Subtract Uncollected Fees Provision
14	Add Collection of Fees in Arrears
15	Subtract Doc 5 Adj
16	Tuition before UWC
17	Grant + Tuition before UWC

### *Monitoring Report Revenue Tables*

- 1) 2004-05 FAS St. George Graduate Eligible Revenue Summary (BIU Value at 5,110)
- 2) 2008-09 FAS St. George Graduate Eligible After Finca Revenue Summary (BIU Value at 5,110)
- 3) FAS St. George Graduate Expansion (2008-09 Eligible minus 2004-05 Eligible) Table of Deltas (BIU Value at 5,110)
- 4) FAS St. George Graduate Expansion Table of Deltas (BIU Value at 5,110) by Term (this table is used to show a breakdown by term for the purpose of tying the fall FFTE number)
- 5) back to Monitoring Report table 1.
- 6) FAS St. George Graduate Expansion Table of Deltas (BIU Value at 5,110) by Funded Cohort

### *Revenue Reports*

The following two programs (report\_dollars.sps and report\_dollars\_program.sps) generate the revenue components and total for FAS as well as for specific programs and/or departments. The purpose of these reports is to display a snapshot of the current revenue situation for the entire division or a specific program/department at the request of the CFO or department Chair.

### *Infinite Reporting Capabilities*

Any desired column layout of any combination of the following data elements can be designed at the push of a button.

```
measure t unit division forpos campus sector department ftptrgst  
degree_type degree_type_aggregate dom_intl feecattx hl_fee yrlvl  
new campus_incidental funded_cohort course_band regtype t1 TO t20  
a1 TO a20 bf1 TO bf20 af1 TO af20
```

## **5. Testing and Validation**

### **Introduction**

This chapter contains a qualitative and quantitative analysis of the model. The qualitative analysis consists of a discussion on robustness of the model in different situations, and future speculation. The quantitative analysis consists of a test of accuracy. This test involves going back in time and sending actuals into the model as targets to see what the model would have provided. The overall purpose of this chapter is to close the loop.

### **Qualitative Analysis**

#### **Robustness of the Model**

##### *Program Fee Implementation*

In terms of the robustness of the model, the model has continued to serve FAS with a few changes, such as the addition of new programs, and the acquisition of centers and institutes from SGS. When a new count file is saved in the count directory, and the entire model is run, it automatically recalibrates the factors, and knows where the projections start.

In fall 2008, the model underwent a major change, enabling it to handle the decision to implement program fees to be applied to new students starting in fall 2009. Some programs already had the fees in place (commerce, bioinformatics, computer science), while others did not. Further complicating the problem, were the varying thresholds for charging program fees. The threshold was to remain at 4.0 FCE for 2009-

10 and 2010-11, then move to 3.0 in 2011-12 thereafter. Since the threshold for determining a student's full-time/part-time status is 3.0 FCEs, it would be possible in the first two years after inception that students could be full-time, and still pay per course. Scenarios needed to be run that compared enrolment, before and after program fees, with/without intensification of 0.5 FCE of student course load.

The implementation of program fees involved two phases. The first phase is known as the pre-Governing Council phase, which was the initial plan to charge program fees to full-time students. This phase had the following steps. The first was to obtain data from peer institutions in the U.S. as well as 10 Ontario institutions in order to compare their methodologies for charging tuition fees. The second was to determine which institutions charged program fees and the full-time/part-time threshold used for doing so. The third was to overhaul the tuition tables, allowing for the phase-in of proposed program fees based on a full-time/part-time basis. The fourth step was to automate the grand parenting of tuition fees for future graduate and undergraduate students, allowing for different growth rates for new and returning students. The fifth step was to create computer programs allowing for student course intensification assumptions to be built right into the average FFTE and BIU tables that are generated from the count. Scenarios were originally run with different intensification assumptions. However, the most conservative assumption of 0.5 FCE was considered the most realistic.

The second phase of program fee implementation is known as the post-Governing Council phase, and had the following steps. The phases are differentiated because the decision to implement program fees at the threshold of 0.4 FCE for the first two years

arose out of a Governing Council meeting on May 20, 2009. The simplest way to implement program fees would have been to use the threshold of 0.3 FCE, as it was consistent with the full-time/part-time definition, however, the Governing Council members felt it was too drastic to go straight to a threshold of 3.0 FCE immediately. The first step involved adding a course band data element to the model to allow program fees to be charged based on different course loading assumptions. The second step involved an enhancement to the model to allow for the modeling of the undergraduate formula post categories for the purpose of applying more precise average BIU weights for revenue calculations. This enhancement also made it possible to charge differential tuition fees to arts and science students, both with and without program fees. There was some discussion around charging differential program fees based on whether students were arts or science, but was never formally modeled.

### *Changes in Funding Formula*

The education system in Michigan is like Ontario in the sense that institutions have their own charters, but there is no funding formula in Michigan as there is in Ontario. Institutions must lobby the government for a share of funds set aside for education. There is an incentive in Michigan to “out-lobby” one another. Some of the more populous U.S. states, namely California, Texas, New York, Florida, and Pennsylvania are state run systems with a single charter for the state. The state determines how resources are allocated, and where certain programs are offered.

If the Ontario Government changed certain aspects of the funding formula, such as BIU weights and the BIU value, the model could easily be updated to reflect the change. If Ontario abandoned the funding formula, and went to a lobbying system like

Michigan, different BIU weights could be set by the institution with a BIU value set based on how much of the educational money they will be successful in lobbying for. The formula fee deduction could be zeroed out. The abandonment of the formula fee would force a fundamental change in the budget model, introducing an internal BIU weight, which the University of Toronto rejected when they moved to the new budget model.

In a state run system such as SUNY in New York, the model could be used by the state to calculate tuition and grant revenue for the entire system. The campus data element could be populated with the institutions to see how much of that revenue is generated by each institution, division, department, and programs.

#### *Deregulated Tuition Fees*

The model is currently equipped to charge differential tuition fees based on unit, domestic/international, sector, department, and year level. If a differential fee were to be charged to transfer students, a new data element could be implemented to capture them. If the Ontario government decided it would only fund Ontario residents, and allowed universities to charge out-of-province students a fee between the domestic and international, an additional value could be added to the high/low fee data element to capture the change (high fee, mid fee, low fee).

#### *Partially BIU-Eligible Students*

If the university decided they wanted to track BIU-eligible students who only accumulate partial BIU due to being close to the cumulative BIU maximum could do so

by implementing a value of “partial” to the fee category data element. This would be useful in determining which graduate departments and programs students take the longest to finish in, and could be used to argue for a maximum time-to-completion student policy.

## **Future Speculation**

### *Expanding the Model to the Entire University*

Expansion of the model to serve the entire university would involve the following changes to inputs. (Input 1) Since the enrolment headcount data contain data for the entire university, the tables produced from it already encompass all of the university. (Input 2) Additional target spreadsheets would need to be produced for the other divisions to fill in with headcounts. Given the number of different departments at the university, a web application could be developed for the purpose of submitting enrolment targets. The model could then automatically extract the data, and bypass using spreadsheet inputs. Enrolment scenarios could be run, by applying a computer program to the raw data, in order to implement the desired scenario. (Input 3) The financial cancel (finca) and cancellation (canc) tables already extract data for the entire institution. (Input 4) FAS past commerce courses are already extracted for the entire institution. (Input 5) The FAS extract would need to have the FAS only restriction lifted by SIS in order to span the entire university. The part of the extract that computes FFTEs (extract\_8\_crs\_count.sps) would need to be modified to take into account other course loading assumptions from the other divisions. This step may involve creating an additional table to store course loads for all divisions. If course loads have changed over

time, a time series of data may be necessary. (Input 6) The tuition fee tables would need to be populated with data from other divisions for both undergraduate and graduate. These tables are currently stored in a spreadsheet, and updated annually. If historical fees are stored in ROSI, this process could be streamlined by automatically extracting the fees. Manual data entry for FAS is not too onerous, but the entire university could be. If the model were to be expanded to serve the entire university, other anomalies would need to be dealt with as they came up. For example, the Faculty of Architecture, Landscape and Design, has two ministry program categories, and one would need to know when and why they both apply. Another example would be duplicate graduate departments spanning multiple campuses. In FAS, graduate units are either housed at the St. George campus or at one of the other campuses in its entirety. What if the Faculty of Medicine had a public health sciences department at the Mississauga campus as well as the downtown campus, and treated them as two distinct departments? They would need to be differentiated in the inputs.

### *Linking the Model to Costs*

Currently, tuition and grant revenue calculated in the model are inserted into the budget. The revenue subtotal consists of tuition, grant, investment income, and other income, and is the amount that percentage costs are deducted. In the 2008-09 budget, approximately 36 percent was deducted for UWC, 10 percent for the University Fund, and 17 percent from the tuition portion for student aid. These central costs could be built into the model as exogenous data elements. Other deductions could be built in such as the funding guarantee for students in the funded cohort, and the departmental transfer of \$10,000 (now \$9,000 as of Fall 2010) for growth in BIU-eligible students for graduate

expansion. In other universities that use RCB/RCM, the UWC is split into two parts. The first is a fixed university-wide overhead rate, while the second consists of variable indirect cost rates that are recalibrated annually.

Alternatively, FAS and the university could engage in a pilot project to develop an automated program costing methodology, to capture all costs associated with programs, and abandon the UWC method. The financial and human resource systems store cost information about direct departmental costs (teaching salaries, admin salaries, benefits, non-salary operating). Salaries for faculty would need to be split into the departments they service teach to, which could be obtained from timetabling data. For example, suppose that a computer engineering professor, paid out of a computer engineering cost center, taught a computer engineering course and a computer science course. The salary should be split between the two departments. In addition, knowledge of faculty workload would make it possible to compare them to similar institutions in studies like the Delaware Study of Costs and Productivity to ensure the university is maximizing the use of the faculty complement available to it.

The financial system and space inventory store information about departmental space and dean's office costs (divisional registrar, divisional advancement, divisional finance, divisional human resources, etc), which could be allocated to departments based on their share of total student FTEs. Timetabling data could be used to determine who is using the space. For example, if the department of chemistry owns space in building X, but it is used by chemical engineering, it should appear as a cost in the chemical engineering department.

The indirect costs and overhead costs are also captured in the financial system, and could be attributed to divisions based on the services they use or by their share of FFTEs and/or headcount. Examples of indirect costs include central advancement, central human resources, central finance, central space, physical plant, etc. Divisions could allocate indirect costs to departments based on their share of total student FFTEs. Once all costs are allocated to departments, an FFTE matrix consisting of departments by programs could be used to allocate the costs from departments to the individual programs. One would need to be careful in comparing graduate student FFTEs and undergraduate student FFTEs as they are calculated differently. A graduate student could generate 3.0 FFTEs in a fiscal year, while an undergraduate student could generate 1.0 FFTEs over the same time period. Questions like does it really cost three times as much to educate a graduate student as an undergraduate student, or should graduate student FFTEs be converted into undergraduate student FFTEs by dividing by 3? The costs could be grouped into 3 broad categories (direct, indirect local, indirect central).

An automated program costing model would enable FAS and other divisions to run costing scenarios and answer questions such as; if we have our own local human resources, why are we paying for central human resources? If we build a more efficient building to house all operations of FAS, how much would this cut central costs?

At this point, the cost model could be linked to the revenue model to answer the following question, is program X financially viable? Knowledge of such information could allow for more informed decisions concerning the enrolment mix in various programs. For example, if the net revenue per international student is negative, but the net revenue per domestic student is positive, it makes more sense financially to admit

more domestic students. Alternatively, if net revenue is lower for science students, it may be worth admitting more arts students.

### *Student Aid Set-aside*

The student aid set-aside is a percentage of the total tuition that is earmarked for student aid that is not met by the province. For example, if an Ontario student needs \$5,000, and is eligible to receive an interest free loan of \$4,000 from the government, the un-met need for the student is \$1,000. The university would allocate the un-met need of \$1,000 to the student from the earmarked funds. The net tuition for the university in this example for the student is \$4,000, as the net tuition consists of tuition minus student aid obligations.

Rather than use a percentage to deduct student aid set-aside, the model could be modified to connect to a lookup table containing the average dollar amount of need per FFTE by program category. The FFTEs would be multiplied by these amounts, and deducted from tuition, similar to a standard fee deduction on the grant side. FAS could then determine whether the percentage they pay is too high.

### *Ontario Healthcare Application*

The model could be applied to health care to calculate how much grant revenue hospitals will receive. Beds could be thought of as FFTEs, BIU weights could be applied to beds based on the type of illness. Hospitals could run scenarios to help decide which type of bed incurs the lowest net cost. They would also need to consider the costs associated with each bed, as well as the demand for those beds. An automated costing model would help in this case to check whether a bed of type X is financially viable.

### *A Hypothetical Collaborative U.S. Healthcare / Transportation Initiative*

Suppose lymphomas (cancers of the white blood cells) were determined to be the leading cause of death in Maryland, and the state wanted their top medical schools to test the effectiveness of the use of genetically modified human viruses in destroying cancer cells. Suppose US-50 was no longer a feasible transportation route between Baltimore, Salisbury, and Ocean City due to traffic congestion, and wait times at the Bay Bridge of several hours on summer weekends. Suppose the state wanted to consider whether to build an 80 MPH electronic toll road (I-68) as an alternative to US-50 called “Ocean Gateway” that would solve congestion issues. The road could be financed through issuing state bonds to the public in a “drive for a cure” campaign. Toll revenue would go towards cancer research, debt repayment, and maintenance.

The model could be used in a hypothetical case like this to convert existing US-50 traffic volumes into revenue spanning several months. Scenarios could explore differential tolling of cars based on the type of car. For example, hybrid vehicles may have a weight of 1.0, while transport trucks have a weight of 2.0. Exemptions for certain individuals (for example, war veterans) could be built in to the model. A portion of costs similar to that of the UWC could be deducted for debt financing and maintenance.

### *Weather Forecasting*

The monitoring aspects of the model could be expanded to assist in warning the public when potentially deadly severe weather approaches, as well as automating tornado sirens in the rare but deadly instances of tornadoes that occur at night. The inputs could include local and distant radar, barometric pressure, upper and lower level winds,

humidity, ceiling, height of cloud deck, proximity to jet stream, historical data, etc. A computer program could extract data, and check for certain conditions every minute. When conditions become favourable for the imminent development of tornadoes, a tornado warning would be issued by the computer program. In the case of night-time tornadoes, the warning would trigger tornado sirens to wake people up in order to take cover, when they would normally not have a radio or television on.

## Quantitative Analysis

A series of two tests are performed to illustrate the accuracy of projections in the model similar to the tests performed by Oliver in (Hopkins & Massy, 1981, p. 360). The model was calibrated back to the end of the previous fiscal year for 2007-08, 2008-09, and 2009-10. The year 2007-08 was selected as the starting point because it was the first year of the new budget model at the University of Toronto. Prior to 2007-08, the university did not calculate the effective BIU. In the model, the effective BIU and BIU value are equal to 5,110 until that point.

The following table illustrates the performance of the model. The model was tested by going back to a prior year, and sending the actual enrolments beyond that year through the model as targets. For example, suppose the actual enrolment consist of data from 2000-01 through 2010-11. When the model is calibrated back to the end of 2008-09, the 2009-10 actuals are sent through the model as targets. In the following table, the 2009-10 actual sent in as a target would have produced an undergraduate revenue higher than the actual by 1.4 percent. The implication of this is that the model can be calibrated and tested for all years. This test was completed, and can be found in Appendix 60. The trend over time shows a decline in error with the increase of available data.

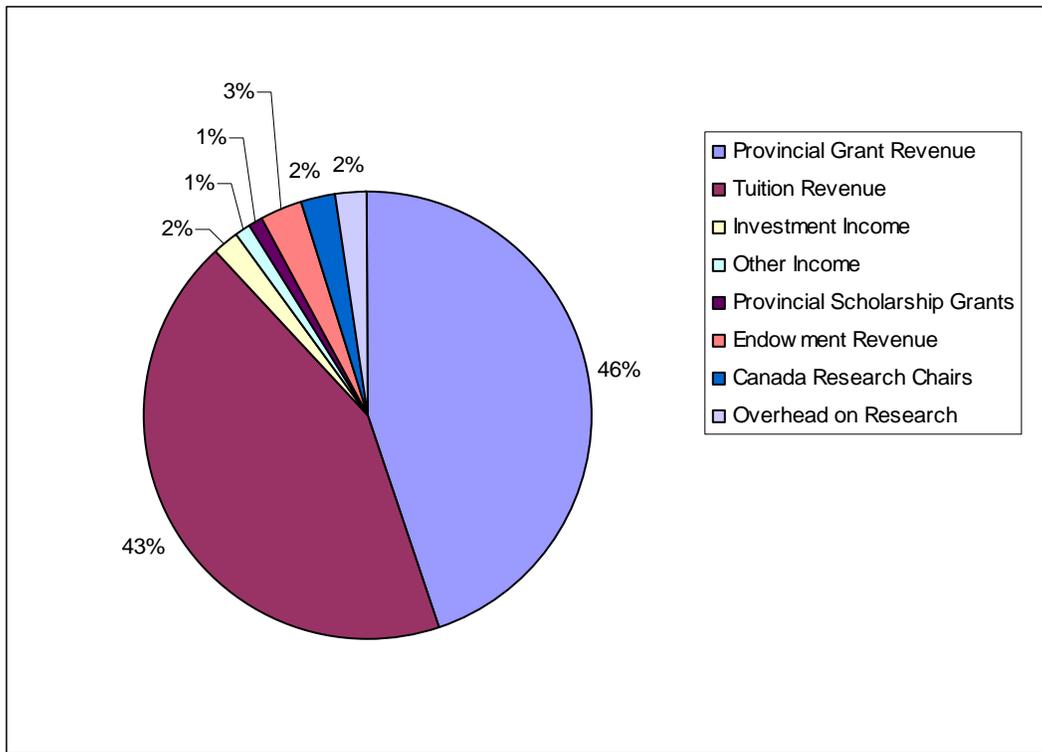
**TABLE 28: Model Accuracy**

Target	Undergraduate Difference Between Projections and Actuals	Graduate Difference Between Projections and Actuals	Notes
2007-08	2.2 percent	2.4 percent	Calibrated to end of 2006-07
2008-09	2.8 percent	1.1 percent	Calibrated to end of 2007-08
2009-10	1.4 percent	1.8 percent	Calibrated to end of 2008-09

## Impact on Model of Reduction in Grant

The first table illustrates the share of the different types of revenue in the 2008-09 FAS budget. It is worth noting that tuition and grant make up 89 percent of total revenue.

**TABLE 29: Total FAS Revenue from 2008-09 Budget**



Suppose the provincial government decided that 10 percent of the grant would be distributed based on provincial performance indicators. If the increase was not new money, the impact on the model would be a reduction in the effective BIU by 10 percent. A new element would need to be added to the grant calculation that attempts to capture the amount the institution would receive from performance indicators. This would not be able to be done at the divisional level because divisions would need knowledge of all

universities in the system to determine how they perform relative to others on the indicators.

## **6. Conclusion**

### **Building the Model**

The model takes six inputs and prepares them for entry into it. These inputs include historical enrolment data, fall enrolment targets, student cancellation rates, course data, the upcoming fiscal year extract data, and tuition fee tables. The model then generates a cube with various data elements that allow for infinite reporting capabilities. The cube has the capability of being made live and viewed on the Internet using software packages such as COGNOS or Beyond 2020. These software packages enable the creation of a graphical user interface in which the data elements of an SPSS cube can be viewed on the web in many user-defined configurations. For example, one user may wish to view divisional enrolment projections, while another may wish to view departmental full-time enrolment projections. This capacity has currently not been explored.

The model presented in this thesis was built to serve various stakeholders as well as allow for infinite reporting capabilities. The first assumption is that history repeats itself, for example, fourth-year doctoral students in department X, degree type Y will behave in the future as they did in the past. The second assumption is that if a detailed factor did not exist for a new program, it would use data at higher levels of detail, until a factor was found. For example, a new professional masters program in economics will behave similarly to existing social science professional masters programs. These assumptions were based on actual experience.

Some of the unexpected problems encountered during the initial stages of the building of the model included the following. The first was how to handle new programs and automate this handling. The second was how to automate the grand-parenting of tuition fees. The third was how to expand the model to encompass undergraduate projections. The key difference between graduate and undergraduate data was that graduate student records can easily be assigned to a department and sector, while undergraduate records had to be assigned to pseudo departments (commerce, computer science, other undergraduate, etc.) based on algorithms that looked at the program of study and/or courses. The fourth was how to take into account cumulative BIUs to determine BIU-eligibility of student records in the extract. The table that stores this information in the student administration system tended to lag behind the latest count by a term. This lag gave rise to the need to build an algorithm to anticipate BIU accumulations in each term of the extract. Finally, it was clear early on that graduate target data submissions needed to be standardized. If they were not standardized, there would need to be a different computer program to read the data for every single different type of input sheet.

The main development that gave rise to the need for an automated enrolment projection model was not the new budget model itself, but the demands that it placed on decision makers. The new budget model arose out of a task force that recommended approaches to budgeting that would increase transparency of budget allocations, provide incentives to increase revenues, control costs, and ensure the most optimal alignment between revenues and academic priorities. Divisions had to become responsible for forecasting revenues based on different enrolment levels. They also had to be able to

predict whether targets would or would not be met in advance, and have the time to take remedial action if necessary.

## **Performance**

The controllable data elements in the model are headcount and tuition fees. Headcount ultimately drives tuition revenue and grant revenue defined by the Ontario operating grant formula. The model is designed as a series of modules that are easily adaptable to change. In actual experience, the assumptions were correct. The model was tested by going back to a prior year, and sending the actuals beyond that year through as targets. The model was easily adaptable to institutional changes such as the addition of new programs and major institutional changes such as program fee implementation. The concept of program fees was explored in fall 2008, and the model was able to provide support to decision makers in order to begin charging program fees the following fall. The stakeholders did not make use of the entire model, but rather specific parts of it. For example, the Vice Dean was concerned more with graduate revenue, while the Chief Financial Officer and Dean were more concerned with divisional revenue.

The model could be expanded to handle other universities like the U of T, as well as the U of T itself. Institutions are constantly changing, and where ever possible, enrolment projections should be automated to reduce the resources needed in implementing change. According to Mintzberg, there are three findings about information for planning. The first is that most information for planning is often limited in scope, requiring managers to build their own personal information systems to capture what they need. For example, if a manager needs courses and the rank of the instructor

who taught the course in the same spreadsheet row for a report, he/she may need to link two or more databases to obtain the information. The second is that most information for planning is too aggregated for effective use. For example, a manager who is pressed for time is more likely to have information aggregated to save time. Finally, most information for planning arrives too late due to the aggregation of information for reports, and the creation of the reports themselves (Mintzberg 1998, p. 70-71).

In terms of benefits of the model not anticipated at the start, the following were observed. The first was that the model has the capability of being expanded to serve the entire university as well as other campuses. Although it has never been used in this way, it could be. The model could be expanded to serve the entire Province and be used to calculate the effective BIU for each institution. If the government used the model to calculate the effective BIU, it could inform universities of budget cuts earlier so they could take remedial action. The second benefit was the ability to calibrate itself to a prior year and measure the financial benefit of various enrolment policy decisions. For example, it could answer policy questions such as, “What was the impact of the Dean's decision last year to increase International enrolment by 100 full-time students?” The third benefit of the model was that the data produced by it are readily available and used by academic departments as well as non-academic departments. For example, in the department of space and infrastructure planning, graduate headcount is a driver for assigning office space. The fourth benefit of the model was that it does not require several institutional analysts to provide data to stakeholders from it. It can be done with one person. Some institutional research departments have a manager of enrolment with a few analysts reporting to the manager that spend a lot of their time maintaining

spreadsheets. Finally, the fifth benefit is that the tables produced at any point in the creation of the model can be connected later on for output purposes. For example, a report could be created connecting the cube the model produces with the average course load, produced as one of the count tables. This report would allow the user to see a measure like headcount along with average course load.

On the basis of actual experience, I would have investigated the possibility of extracting historical tuition fees from the student information system rather than keeping them as a Microsoft Excel input. If the model was to be expanded to the entire university or the rest of the Province, the manual entry of new tuition fees each year would be time consuming.

The model presented in this thesis plus the possible link to costs is essentially a means of making RCB/RCM and/or variants of it work. In higher education, many universities that choose to implement RCB/RCM have difficulty navigating through the data needed to support it, making it a disadvantage of RCB/RCM. The model is able to automate the grant and tuition calculations at varying levels of detail. The automation of program costs would allow institutions to quickly compare program X in terms of revenue and expenditures. If the expenditures exceed the revenues, the institution could drill into a cost cube at different layers of detail to see why the program is not solvent and whether it is worth continuing. For example, if the program contains service teaching from the business school, and business faculty salaries have been increasing at double the rate of other divisions, a curricular change could be in order, reducing the use of business school faculty in program X. Alternatively, the business course teaching could be outsourced to a nearby institution with lower salaries.

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## 8. Appendix

**Appendix 11 - Data Harmonization Table**

<b>Table</b>	<b>Program Call</b>	<b>Description</b>
1	data_harm\creative_writing.sps	Codes all masters in English creative writing to a professional masters program.
2	data_harm\gerontology.sps	Codes all Woodsworth college graduate Gerontology stream students to its own department called Gerontology.
3	data_harm\planning.sps	Codes all graduate Geography planing stream students to a new department called planning.
4	doctoral_program_direct.sps	Codes all doctoral students who entered doctoral programs directly from bachelor programs.
5	data_harm\cfe.sps	Codes the professional masters in Environment to it's own department.
6	data_harm\degree.sps	Obtains the degree associated with a record.
7	data_harm\degree_type.sps	Codes programs into Diplomas and Certificates, Specials, Bachelor, Masters, Each Prof Masters, and Doctoral.
8	data_harm\degree_type_aggregate.sps	Codes programs into Diplomas and Certificates, Specials, Bachelor, Masters, All Prof Masters coded as Prof Masters, and Doctoral.
9	data_harm\forpos.sps	Obtains BIU weights, formula fees, forpos names, and the maximum year level (yrlvl_max) to allow for modelling from province wide forpos table (lookup_common\forpos_lookup.sav).
10	data_harm\unit.sps	This program assigns Undergraduate or Graduate depending on the formula_post_cat.
11	data_harm\department.sps	Obtains the division, sector, and funded cohort rules for all graduate departments from (lookup_common\department_lookup.sav).
12	data_harm\division.sps	Obtains the division from the post code for undergraduate students
13	data_harm\campus.sps	Assigns the campus and campus incidental fields.
14	data_harm\exclude_grad_pdoc_visit.sps	Excludes graduate post-doc and visiting students.
15	data_harm\biuw.sps	The BIU min and max are calculated. PhD students who skipped their masters are funded at masters weights for year 1 of the PhD.
16	data_harm\prof_masters.sps	Names of professional masters are assigned.
17	data_harm\woodsworth.sps	Names of Woodsworth College certificates are assigned.
18	data_harm\session.sps	The session is obtained.
19	data_harm\ftptrgst.sps	Set equal to attendance_class. Not applicable to the count as ftptrgst is already assigned by P&B.
20	data_harm\t.sps	term is set (1 = summer; 2 = fall; 3 = winter).
21	data_harm\yrlvl.sps	Obtains year_of_study and sets special students to yrlvl = 0.
22	data_harm\yrlvl_recode.sps	Year levels of missing and 0 are coded to 1; year levels above the maximum year level used for modelling purposes are set to yrlvl_max.
23	data_harm\y.sps	Obtains the first 4 characters of a funding year. For example, 2004-05 would yield 2004; 2019-20 would yield 2019.
24	data_harm\studid.sps	Converts studid into a string of 10 characters padded by 0's. For example, if the initial studid was 91919, the new studid would be 0000091919.
25	data_harm\firstname_lastname.sps	Renames variables for first and last name.
26	data_harm\regtype.sps	Assigns regtype based on the registration status. 1 = REG; 2 = Dereg; 3 = CANC; 4 = INVIT; 5 = FINCA
27	data_harm\reg.sps	Values consist of REG, Dereg, CANC, INVIT, and FINCA

Appendix 11 - Data Harmonization Table

Table	Program Call	Description
28	data_harm\pgmtype.sps	Assigned based on value of type_of_program: 1=DOC; 2=MAST; 3=PMAS; 4=BACC,BACS,OTH,PREU 5=PSPE, 6=DIPL, 7=CERT, 8=PDOC, 9=VISIT.
29	data_harm\dom_intl.sps	Assigns Domestic if legal status is 0 or 1, otherwise International.
30	data_harm\hl_fee.sps	The over_reg_fee_cat is the override field. If it is blank, legal_status is used to determine whether the students are paying the high or low fee. If over_reg_fee_cat = D, IE, or EX then low fee, otherwise high fee.
31	data_harm\count_uar.sps	Each record is set to 1.
32	data_harm\ugrad_dept_1_initial_group.sps	Undergraduate programs are grouped into 11 groupings based on subject post. 1=Spec Mgmt; 2=Spec Com; 3=Maj Com; 4=Maj Mgmt; 5=Spec CCIT; 6=Maj CCIT; 7=Spec Bioinfo; 8=Spec CSC; 9=Maj CSC; 10=Min CSC; 99=Other.
33	data_harm\ugrad_dept_2_override.sps	Departments are then assigned into 6 pseudo departments: Academic Bridging, Bioinformatics, Commerce, Computer Science, Other Undergrad, Woodsworth.
34	data_harm\claim_level.sps	Field is set to 1 if the program is a masters or prof masters; 2 if the program is a PhD.
35	data_harm\ba3.sps	Field is initialized to 0, set to 1 if a student is taking the 3-year Bachelor's.
36	data_harm\caat_transfer.sps	Field is initialized to 0, set to 1 if a student came from a community college in Ontario.
37	data_harm\course_band.sps	COMPUTE course_band = 0. DO IF (unit = "UGRD"). IF (fte_uar >= 0.30 AND fte_uar < 0.40) course_band = 1. IF (fte_uar >= 0.40 AND fte_uar < 0.45) course_band = 2. IF (fte_uar >= 0.45 AND fte_uar < 0.50) course_band = 3. IF (fte_uar = 0.5) course_band = 4. IF (fte_uar > 0.5) course_band = 5. END IF.
38	data_harm\age.sps	Calculates age as of fall term.
39	data_harm\ugrd_subgroup.sps	Initialized to 0 and then set to 1 if department is CTEP, IFP, or degree is 3-year bachelor degree.
40	data_harm\funded_cohort.sps	Renames the grad_fund_ind field to funded_cohort.
41	data_harm\application_type.sps	Assigns OAC, Non OAC - Transfer Credit, or Non OAC - Non Transfer Credit to new fall undergraduate students based on the application type.

Appendix 13 - Count Tables

Table	grp	Program Call	Table Name	Selection Criteria	Data Type	Table Layout	Notes
1	1	projection_start.sps	start.sav		N/A	unit calcyr calct	Tracks when the projections start in terms of the year and term.
2	2	actual_count.sps	actual_count_summer.sav	t = 1	Head Count	t unit division forpos campus dom_intl ftptrgst yr1vl degree_type_aggregate sector department degree_type feecattx hl_fee new campus_incidental regtype a1 TO a20 t1 TO t20	Actual Summer Headcount
3	2	actual_count.sps	actual_count_fall.sav	t = 2	Head Count	Same as above with t1 TO t20 zeroed out to allow file to be inserted into the model without having to set missing elements to zero.	Actual Fall Headcount
4	2	actual_count.sps	actual_count_winter.sav	t = 3	Head Count	Same as above	Actual Winter Headcount
5	2	actual_count.sps	actual_count.sav	No selection criteria.	Head Count	Same as above without t1 TO t20	Actual Headcount
6	2	actual_ffte.sps	actual_ffte.sav	No selection criteria.	FFTE	t unit division forpos campus dom_intl ftptrgst yr1vl degree_type_aggregate sector department degree_type feecattx hl_fee new campus_incidental regtype a1 TO a20	Actual FFTEs
7	2	actual_biu.sps	actual_biu.sav	No selection criteria.	BIU	t unit division forpos campus dom_intl ftptrgst yr1vl degree_type_aggregate sector department degree_type feecattx hl_fee new campus_incidental regtype a1 TO a20	Actual BIUs

Appendix 13 - Count Tables

Table	grp	Program Call	Table Name	Selection Criteria	Data Type	Table Layout	Notes
8	3	last_fall.sps	last_fall.sav	t = 2 Based on last year	Head Count	t unit division ftptrgst campus t degree_type_aggregate sector department degree_type dom_intl year1 TO year7	year1 through year7 correspond to yr1vl for the purpose of flowing through last year's new and returning students.
9	3	flowthru_repeat_algorithm.sps	degree_type.sav	t = 2 cohort >= 2000 (y-cohort+1) = yr1vl OR y-cohort = yr1vl	Head Count	unit division ftptrgst campus t degree_type_aggregate sector department degree_type flowthru_rate_degree_type1 TO flowthru_rate_degree_type7 repeat_rate_degree_type1 TO repeat_rate_degree_type7	See flow through rate methodology.
10	3	flowthru_repeat_algorithm.sps	department.sav	Same as above.	Head Count	unit division ftptrgst campus t degree_type_aggregate sector department flowthru_rate_degree_type1 TO flowthru_rate_degree_type7 repeat_rate_degree_type1 TO repeat_rate_degree_type7	Same as above.
11	3	flowthru_repeat_algorithm.sps	sector.sav	Same as above.	Head Count	unit division ftptrgst campus t degree_type_aggregate sector flowthru_rate_degree_type1 TO flowthru_rate_degree_type7 repeat_rate_degree_type1 TO repeat_rate_degree_type7	Same as above.
12	3	flowthru_repeat_algorithm.sps	degree_type_aggregate.sav	Same as above.	Head Count	unit division ftptrgst campus t degree_type_aggregate flowthru_rate_degree_type1 TO flowthru_rate_degree_type7 repeat_rate_degree_type1 TO repeat_rate_degree_type7	Same as above.

Appendix 13 - Count Tables

Table	grp	Program Call	Table Name	Selection Criteria	Data Type	Table Layout	Notes
13	4	imputed_1_binary_algorithm.sps	new_degree_type.sav	t = 2	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate sector department degree_type new_rate_degree_type	"new_rate_..." fields are the percentage share of new students since Fall 2000 by level of detail in table. No new intake in 3yr BA after Fall 2001. Once the model was modified to allow for new intakes to be fed in, these tables were no longer used, but still created.
14	4	imputed_1_binary_algorithm.sps	new_department.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate sector department new_rate_department	Same as above.
15	4	imputed_1_binary_algorithm.sps	new_sector.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate sector new_rate_sector	Same as above.
16	4	imputed_1_binary_algorithm.sps	new_degree_type_aggregate.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate new_rate_degree_type_aggregate	Same as above.
17	4	imputed_1_binary_algorithm.sps	new_degree_type_yr1vl.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl new_rate_yr1vl	Same as above.
18	4	imputed_1_binary_algorithm.sps	new_campus.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus new_rate_campus	Same as above.

Appendix 13 - Count Tables

Table	grp	Program Call	Table Name	Selection Criteria	Data Type	Table Layout	Notes
19	4	imputed_1_binary_algorithm.sps	feecat_yes_degree_type.sav	t = 2	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate sector department degree_type feecat_yes_rate_degree_type	"feecat_yes_rate_..." fields are the percentage share of BIU eligible students since Fall 2000 by level of detail in table.
20	4	imputed_1_binary_algorithm.sps	feecat_yes_department.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate sector department feecat_yes_rate_department	Same as above.
21	4	imputed_1_binary_algorithm.sps	feecat_yes_sector.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate sector feecat_yes_rate_sector	Same as above.
22	4	imputed_1_binary_algorithm.sps	feecat_yes_degree_type_aggregate.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate feecat_yes_rate_degree_type_aggregate	Same as above.
23	4	imputed_1_binary_algorithm.sps	feecat_yes_yr1vl.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl feecat_yes_rate_yr1vl	Same as above.
24	4	imputed_1_binary_algorithm.sps	feecat_yes_campus.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus feecat_yes_rate_campus	Same as above.

Appendix 13 - Count Tables

Table	grp	Program Call	Table Name	Selection Criteria	Data Type	Table Layout	Notes
25	4	imputed_1_binary_algorithm.sps	hl_fee_yes_degree_type.sav	t = 2	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate sector department degree_type hl_fee_yes_rate_degree_type	"hl_fee_yes_rate_..." fields are the percentage share of "high fee" paying students since Fall 2000 by level of detail in table.
26	4	imputed_1_binary_algorithm.sps	hl_fee_yes_department.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate sector department hl_fee_yes_rate_department	Same as above.
27	4	imputed_1_binary_algorithm.sps	hl_fee_yes_sector.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate sector hl_fee_yes_rate_sector	Same as above.
28	4	imputed_1_binary_algorithm.sps	hl_fee_yes_degree_type_aggregate.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate hl_fee_yes_rate_degree_type_aggregate	Same as above.
29	4	imputed_1_binary_algorithm.sps	hl_fee_yes_yr1vl.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl hl_fee_yes_rate_yr1vl	Same as above.
30	4	imputed_1_binary_algorithm.sps	hl_fee_yes_campus.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus hl_fee_yes_rate_campus	Same as above.

Appendix 13 - Count Tables

Table	grp	Program Call	Table Name	Selection Criteria	Data Type	Table Layout	Notes
31	4	imputed_1_binary_algorithm.sps	funded_cohort_yes_degree_type.sav	t = 2	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate sector department degree_type funded_cohort_yes_rate_degree_type	"feecat_yes_rate_..." fields are the percentage share of BIU eligible students since Fall 2000 by level of detail in table.
32	4	imputed_1_binary_algorithm.sps	funded_cohort_yes_department.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate sector department funded_cohort_yes_rate_department	Same as above.
33	4	imputed_1_binary_algorithm.sps	funded_cohort_yes_sector.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate sector funded_cohort_yes_rate_sector	Same as above.
34	4	imputed_1_binary_algorithm.sps	funded_cohort_yes_degree_type_aggr	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate funded_cohort_yes_rate_degree_type _aggregate	Same as above.
35	4	imputed_1_binary_algorithm.sps	funded_cohort_yes_yr1vl.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl funded_cohort_yes_rate_yr1vl	Same as above.
36	4	imputed_1_binary_algorithm.sps	funded_cohort_yes_campus.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus funded_cohort_yes_rate_campus	Same as above.

Appendix 13 - Count Tables

Table	grp	Program Call	Table Name	Selection Criteria	Data Type	Table Layout	Notes
37	4	imputed_1_binary_algorithm.sps	course_band_yes_degree_type.sav	t = 2	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate sector department degree_type course_band_yes_rate_degree_type	"course_band_yes_rate_..." fields are the percentage share of BIU eligible students since Fall 2000 by level of detail in table.
38	4	imputed_1_binary_algorithm.sps	course_band_yes_department.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate sector department course_band_yes_rate_department	Same as above.
39	4	imputed_1_binary_algorithm.sps	course_band_yes_sector.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate sector course_band_yes_rate_sector	Same as above.
40	4	imputed_1_binary_algorithm.sps	course_band_yes_degree_type_aggregate.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate course_band_yes_rate_degree_type_aggregate	Same as above.
41	4	imputed_1_binary_algorithm.sps	course_band_yes_yr1vl.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl course_band_yes_rate_yr1vl	Same as above.
42	4	imputed_1_binary_algorithm.sps	course_band_yes_campus.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus course_band_yes_rate_campus	Same as above.

Appendix 13 - Count Tables

Table	grp	Program Call	Table Name	Selection Criteria	Data Type	Table Layout	Notes
43	4	imputed_2_campus_algorithm.sps	campus_degree_type.sav	t = 2	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate sector department degree_type rate_erin_degree_type rate_scar_degree_type	"rate_erin_..." and "rate_scar_..." fields are the percentage share of Erindale and Scarborough students since Fall 2000 by level of detail in table.
44	4	imputed_2_campus_algorithm.sps	campus_department.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate sector department rate_erin_department rate_scar_department	Same as above.
45	4	imputed_2_campus_algorithm.sps	campus_sector.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate sector rate_erin_sector rate_scar_sector	Same as above.
46	4	imputed_2_campus_algorithm.sps	campus_degree_type_aggregate.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl degree_type_aggregate rate_erin_degree_type_aggregate rate_scar_degree_type_aggregate	Same as above.
47	4	imputed_2_campus_algorithm.sps	campus_yr1vl.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus yr1vl rate_erin_yr1vl rate_scar_yr1vl	Same as above.
48	4	imputed_2_campus_algorithm.sps	campus_campus.sav	Same as above.	Head Count	t unit division dom_intl ftptrgst campus rate_erin_campus rate_scar_campus	Same as above.

Appendix 13 - Count Tables

Table	grp	Program Call	Table Name	Selection Criteria	Data Type	Table Layout	Notes
49	5	sw_4_compute.sps	sw_degree_type.sav	Based on all existing data.	Head Count	unit division campus ftptrgst degree_type_aggregate sector department degree_type s_over_f_degree_type w_over_f_degree_type	See summer over fall and winter over fall methodology.
50	5	sw_4_compute.sps	sw_department.sav	No selection criteria.	Head Count	unit division campus ftptrgst degree_type_aggregate sector department s_over_f_department w_over_f_department	Same as above.
51	5	sw_4_compute.sps	sw_sector.sav	No selection criteria.	Head Count	unit division campus ftptrgst degree_type_aggregate sector s_over_f_sector w_over_f_sector	Same as above.
52	5	sw_4_compute.sps	sw_degree_type_aggregate.sav	No selection criteria.	Head Count	unit division campus ftptrgst degree_type_aggregate s_over_f_degree_type_aggregate w_over_f_degree_type_aggregate	Same as above.
53	5	sw_4_compute.sps	sw_ftptrgst.sav	No selection criteria.	Head Count	unit division campus ftptrgst s_over_f_ftptrgst w_over_f_ftptrgst	Same as above.

Appendix 13 - Count Tables

Table	grp	Program Call	Table Name	Selection Criteria	Data Type	Table Layout	Notes
54	6	avg_ffte_weight_algorithm.sps	avg_ffte\degree_type.sav	Based on all existing data.	FFTE	unit division campus degree_type_aggregate dom_intl feecattx ftptrgst t yr1vl sector department degree_type avg_ffte_degree_type	Sum of FFTEs since Summer 2000 divided by the sum of headcount since Summer 2000.
55	6	avg_ffte_weight_algorithm.sps	avg_ffte\department.sav	No selection criteria.	FFTE	unit division campus degree_type_aggregate dom_intl feecattx ftptrgst t yr1vl sector department avg_ffte_department	Same as above.
56	6	avg_ffte_weight_algorithm.sps	avg_ffte\sector.sav	No selection criteria.	FFTE	unit division campus degree_type_aggregate dom_intl feecattx ftptrgst t yr1vl sector avg_ffte_sector	Same as above.
57	6	avg_ffte_weight_algorithm.sps	avg_ffte\yr1vl.sav	No selection criteria.	FFTE	unit division campus degree_type_aggregate dom_intl feecattx ftptrgst t yr1vl avg_ffte_yr1vl	Same as above.
58	6	avg_ffte_weight_algorithm.sps	avg_ffte\t.sav	No selection criteria.	FFTE	unit division campus degree_type_aggregate dom_intl feecattx ftptrgst t avg_ffte_t	Same as above.
59	6	avg_ffte_weight_algorithm.sps	avg_ffte\ftptrgst.sav	No selection criteria.	FFTE	unit division campus degree_type_aggregate dom_intl feecattx ftptrgst avg_ffte_ftptrgst	Same as above.

Appendix 13 - Count Tables

Table	grp	Program Call	Table Name	Selection Criteria	Data Type	Table Layout	Notes
60	7	avg_biu_weight_algorithm.sps	avg_biu\degree_type.sav	Based on all existing data.  DO IF (projection_year > 2004). IF (y <= 2004 AND unit = "GRAD" AND department = "Computer Science" AND degree_type_aggregate = "Masters Program") biu_uar = (biu_uar*1.333). END IF. EXECUTE.	BIU	unit division forpos campus degree_type_aggregate dom_intl feecattx ftptrgst t yr1vl sector department degree_type avg_biu_degree_type	Sum of BIUs since Summer 2000 divided by the sum of FTEs since Summer 2000. Upper year 3-year BA students segregated by their own degree category.
61	7	avg_biu_weight_algorithm.sps	avg_biu\department.sav	Same as above.	BIU	unit division forpos campus degree_type_aggregate dom_intl feecattx ftptrgst t yr1vl sector department avg_biu_department	Same as above.
62	7	avg_biu_weight_algorithm.sps	avg_biu\sector.sav	Same as above.	BIU	unit division forpos campus degree_type_aggregate dom_intl feecattx ftptrgst t yr1vl sector avg_biu_sector	Same as above.
63	7	avg_biu_weight_algorithm.sps	avg_biu\yr1vl.sav	Same as above.	BIU	unit division forpos campus degree_type_aggregate dom_intl feecattx ftptrgst t yr1vl avg_biu_yr1vl	Same as above.
64	7	avg_biu_weight_algorithm.sps	avg_biu\t.sav	Same as above.	BIU	unit division forpos campus degree_type_aggregate dom_intl feecattx ftptrgst t avg_biu_t	Same as above.
65	7	avg_biu_weight_algorithm.sps	avg_biu\ftptrgst.sav	Same as above.	BIU	unit division forpos campus degree_type_aggregate dom_intl feecattx ftptrgst avg_biu_ftptrgst	Same as above.

Appendix 13 - Count Tables

Table	grp	Program Call	Table Name	Selection Criteria	Data Type	Table Layout	Notes
66	8	dist_1_ugrd_pct_total.sps	ugrd_pct_total.sav	t = 2 ugrd_subgroup = 0 3-year moving average	Head Count	t unit division campus dom_intl ftptrgst degree_type_aggregate forpos sector department degree_type ugrd_pct_total1 TO ugrd_pct_total7	Percentage share of undergrad headcount by category for purpose of spreading more aggregate targets.
67	8	dist_2_ugrd_pct_intake.sps	ugrd_pct_intake.sav	t = 2 ugrd_subgroup = 0 new = 1 3-year moving average	Head Count	t unit division campus dom_intl ftptrgst degree_type_aggregate forpos sector department degree_type ugrd_pct_intake1 TO ugrd_pct_intake7	Percentage share of undergrad new intake headcount by category for purpose of spreading more aggregate intake targets.
68	8	dist_3_total_spread_by_yrlvl.sps	total_spread_by_yrlvl.sav	t = 2 Based on last year	Head Count	t unit division campus dom_intl ftptrgst degree_type_aggregate forpos sector department degree_type total_spread_by_yrlvl1 TO total_spread_by_yrlvl7	Percentage share of undergrad headcount by year level for purpose of spreading more aggregate targets.
69	8	dist_4_intake_spread_by_yrlvl.sps	intake_spread_by_yrlvl.sav	t = 2 new = 1 Based on last year	Head Count	t unit division campus dom_intl ftptrgst degree_type_aggregate forpos sector department degree_type intake_spread_by_yrlvl1 TO intake_spread_by_yrlvl7	Percentage share of undergrad new intake headcount by year level for the purpose of spreading intake targets across year level to account for students who are new in upper years.
70	8	dist_5_intake_pct_per_yrlvl.sps	intake_pct_per_yrlvl.sav	t = 2 Based on last year	Head Count	t unit division campus dom_intl ftptrgst degree_type_aggregate forpos sector department degree_type intake_pct_per_yrlvl1 TO intake_pct_per_yrlvl7	Percentage share of new undergrad headcount by year of study for purpose of knowing what proportion in year X are new.

Appendix 13 - Count Tables

Table	grp	Program Call	Table Name	Selection Criteria	Data Type	Table Layout	Notes
71	9	biu_1_count_summer.sps	biu_count_summer.sav	unit = GRAD last_update_count = latest winter session type_of_program = Doctoral or Masters (no Specials)	BIU	unit person_id formula_post_cat summer_count_bius summer_count_last_update	Cumulative BIUs as of latest submitted MTCU summer count.
72	9	biu_1_count_fall.sps	biu_count_fall.sav	unit = GRAD last_update_count = latest winter session type_of_program = Doctoral or Masters (no Specials)	BIU	unit person_id formula_post_cat summer_count_bius fall_count_last_update	Cumulative BIUs as of latest submitted MTCU summer count.
73	9	biu_1_count_winter.sps	biu_count_winter.sav	unit = GRAD last_update_count = latest winter session type_of_program = Doctoral or Masters (no Specials)	BIU	unit person_id formula_post_cat winter_count_bius winter_count_last_update	Cumulative BIUs as of latest submitted MTCU winter count.
74	10	fall_ft_grad.sps	fall_ft_grad.sav	t = 2 unit = GRAD ftptrgst = FT  IF (projection_term > t) THEN SELECT (projection_year = y) ELSE SELECT (projection_year-1 = y)	Head Count	second_org_cd forpos dom_int1 funded_cohort2 type_of_program degree_type combined count_uar	funded cohort 2 and combined are calculated specific to this program call
75	11	special_and_pt_grad.sps	special_and_pt_grad.sav	t = 2 AND unit = GRAD ftptrgst = FT OR degree_type_aggregate = Specials	Head Count	projection_year unit division forpos ftptrgst campus t sector degree_type_aggregate degree_type department dom_int1 t1 TO t20	Since the targets contain only FT degree students in Fall 2004 and beyond, missing actuals are added in later.

### FAS Fall FT Graduate Chemistry Enrolment Targets

SGS Div	Unit	MTCU Code	Domestic / International	Funded Cohort	ROSI Type	Degree Type	Actual	Actual	Actual	Actual	Actual	Target	Target	Target	Target	2012 minus 2004
							Fall 2004	Fall 2005	Fall 2006	Fall 2007	Fall 2008	Fall 2009	Fall 2010	Fall 2011	Fall 2012	
3	CHM	263	DOMESTIC	Funded Cohort	DOC	Doctoral Program	92	44	35	41	40	44	44	44	44	-48
3	CHM	263	INTERNATIONAL	Funded Cohort	DOC	Doctoral Program	40	21	21	15	10	6	3	3	3	-37
3	CHM	263	DOMESTIC	Total	DOC	Doctoral Program	104	54	50	57	55	60	56	56	56	-48
3	CHM	263	INTERNATIONAL	Total	DOC	Doctoral Program	42	25	22	16	11	8	4	4	4	-38
3	CHM	263	DOMESTIC	Funded Cohort	DOC1	Doctoral Program Direct		47	50	61	80	96	105	105	105	105
3	CHM	263	INTERNATIONAL	Funded Cohort	DOC1	Doctoral Program Direct		13	15	16	19	19	17	17	17	17
3	CHM	263	DOMESTIC	Total	DOC1	Doctoral Program Direct		55	65	77	105	113	127	127	127	127
3	CHM	263	INTERNATIONAL	Total	DOC1	Doctoral Program Direct		16	21	22	22	20	17	17	17	17
3	CHM	263	DOMESTIC	Funded Cohort	MAST	Masters MA Program										
3	CHM	263	INTERNATIONAL	Funded Cohort	MAST	Masters MA Program										
3	CHM	263	DOMESTIC	Total	MAST	Masters MA Program										
3	CHM	263	INTERNATIONAL	Total	MAST	Masters MA Program										
3	CHM	263	DOMESTIC	Funded Cohort	MAST	Masters MSc Program	13	19	40	40	35	43	40	49	57	44
3	CHM	263	INTERNATIONAL	Funded Cohort	MAST	Masters MSc Program	4	8	12	4		1				-4
3	CHM	263	DOMESTIC	Total	MAST	Masters MSc Program	22	27	48	59	47	55	54	66	77	55
3	CHM	263	INTERNATIONAL	Total	MAST	Masters MSc Program	7	9	15	10		1				-7
3	CHM	263	DOMESTIC	Funded Cohort	MAST	Masters MASc Program										
3	CHM	263	INTERNATIONAL	Funded Cohort	MAST	Masters MASc Program										
3	CHM	263	DOMESTIC	Total	MAST	Masters MASc Program										
3	CHM	263	INTERNATIONAL	Total	MAST	Masters MASc Program										
3	CHM	263	DOMESTIC	Total	PMAS	Prof Masters Slot										
3	CHM	263	INTERNATIONAL	Total	PMAS	Prof Masters Slot										
3	CHM	263	DOMESTIC	Total	PMAS	Prof Masters Slot										
3	CHM	263	INTERNATIONAL	Total	PMAS	Prof Masters Slot										
3	CHM	263	DOMESTIC	Total	PMAS	Prof Masters Slot										
3	CHM	263	INTERNATIONAL	Total	PMAS	Prof Masters Slot										
3	CHM	263	DOMESTIC TOTAL				126	81	98	116	102	115	110	122	133	7
3	CHM	263	INTL TOTAL				49	34	37	26	11	9	4	4	4	-45
3	CHM	263	DEPARTMENTAL				175	115	135	142	113	124	114	126	137	-38

Undergraduate Total Targets as of Dec 9, 2010

t	unit	division	campus	dom_intl	flptrgrst	degree_type_aggregate	t1	t2	t3	t4	t5	t6	t7	t8	t9	t10	t11	t12	t13	t14	t15	t16	t17	t18	t19	t20
2	UGRD	Arts & Science	1_STG	DOMESTIC	FT	Bachelor Degree	12,250	13,178	15,618	17,812	19,200	20,116	19,685	19,481	19,219	19,809	19,968	19,882	19,574	18,677	18,148	17,821	17,822	17,822	17,822	17,822
2	UGRD	Arts & Science	1_STG	DOMESTIC	FT	Bachelor Degree 3yr	4,350	4,073	2,326	1,329	626	349	195	97	88	55	35	17	8	4	2	1	0	0	0	0
2	UGRD	Arts & Science	1_STG	DOMESTIC	FT	Specials	306	293	297	268	261	241	191	172	133	145	153	209	209	209	209	209	209	209	209	209
2	UGRD	Arts & Science	1_STG	DOMESTIC	PT	Bachelor Degree	1,282	1,368	1,715	1,814	1,887	2,046	2,146	2,282	2,173	2,117	2,009	2,465	2,498	2,512	2,519	2,523	2,525	2,526	2,527	2,527
2	UGRD	Arts & Science	1_STG	DOMESTIC	PT	Bachelor Degree 3yr	1,169	1,203	980	794	658	465	381	274	224	168	128	64	32	16	8	4	2	1	0	0
2	UGRD	Arts & Science	1_STG	DOMESTIC	PT	Specials	820	978	1,040	1,012	1,031	1,056	933	792	686	688	682	685	656	628	609	688	688	688	688	688
2	UGRD	Arts & Science	1_STG	INTERNATIONAL	FT	Bachelor Degree	632	850	1,158	1,489	1,961	2,248	2,312	2,372	2,535	2,655	2,948	3,116	3,401	3,637	3,797	3,886	3,886	3,886	3,886	3,886
2	UGRD	Arts & Science	1_STG	INTERNATIONAL	FT	Bachelor Degree 3yr	161	215	119	82	35	13	6	1	3	0	0	0	0	0	0	0	0	0	0	0
2	UGRD	Arts & Science	1_STG	INTERNATIONAL	FT	Specials	16	9	126	117	160	197	197	197	190	192	192	191	191	191	191	191	191	191	191	191
2	UGRD	Arts & Science	1_STG	INTERNATIONAL	PT	Bachelor Degree	27	36	61	54	72	117	111	134	143	149	144	141	141	141	141	141	141	141	141	141
2	UGRD	Arts & Science	1_STG	INTERNATIONAL	PT	Bachelor Degree 3yr	23	26	23	16	12	9	2	1	0	1	1	0	0	0	0	0	0	0	0	0
2	UGRD	Arts & Science	1_STG	INTERNATIONAL	PT	Specials	5	7	24	16	26	29	19	22	16	69	79	132	161	189	208	208	208	208	208	208
2	UGRD	Woodsworth	1_STG	DOMESTIC	FT	Diplomas and Certificates	14	2	16	35	40	29	28	35	33	37	40	35	35	35	35	35	35	35	35	35
2	UGRD	Woodsworth	1_STG	DOMESTIC	PT	Diplomas and Certificates	287	200	180	154	125	120	121	118	126	112	105	122	122	122	122	122	122	122	122	122
2	UGRD	Woodsworth	1_STG	DOMESTIC	PT	Specials	0	0	1	0	1	2	1	3	1	0	0	0	0	0	0	0	0	0	0	0
2	UGRD	Woodsworth	1_STG	INTERNATIONAL	FT	Diplomas and Certificates	0	0	1	1	3	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
2	UGRD	Woodsworth	1_STG	INTERNATIONAL	PT	Diplomas and Certificates	3	2	2	5	3	3	2	0	2	0	0	2	2	2	2	2	2	2	2	2

Undergraduate Subgroup Targets as of Dec 9, 2010

t	unit	division	campus	dom_intl	ftptrgst	degree_type_aggregate	department	degree_type	forpos	sector	t1	t2	t3	t4	t5	t6	t7	t8	t9	t10	t11	t12	t13	t14	t15	t16	t17	t18	t19	t20
2	UGRD	Arts & Science	1_STG	DOMESTIC	FT	Bachelor Degree	CTEP	Bachelor Degree	178	Education									38	69	116	166	180	180	180	180	180	180	180	180
2	UGRD	Arts & Science	1_STG	DOMESTIC	FT	Bachelor Degree	CTEP	Bachelor Degree	180	Education									6	13	22	19	20	20	20	20	20	20	20	20
2	UGRD	Arts & Science	1_STG	DOMESTIC	PT	Bachelor Degree	CTEP	Bachelor Degree	178	Education									1		1									
2	UGRD	Arts & Science	1_STG	DOMESTIC	PT	Specials	Intl Foundation	Specials	103	Arts										5	3	10	10	10	10	10	10	10	10	10
2	UGRD	Arts & Science	1_STG	INTERNATIONAL	FT	Bachelor Degree	CTEP	Bachelor Degree	178	Education											2									
2	UGRD	Arts & Science	1_STG	INTERNATIONAL	PT	Specials	Intl Foundation	Specials	103	Arts										56	71	100	100	100	100	100	100	100	100	100

**Undergraduate Intake Targets as of Dec 9, 2010**

t	unit	division	campus	dom_intl	ftptrgst	degree_type_aggregate	t1	t2	t3	t4	t5	t6	t7	t8	t9	t10	t11	t12	t13	t14	t15	t16	t17	t18	t19	t20
2	UGRD	Arts & Science	1_STG	DOMESTIC	FT	Bachelor Degree	4,116	4,327	4,914	5,234	4,926	4,974	4,349	4,877	4,556	5,220	4,616	4,497	4,307	4,197	4,197	4,197	4,197	4,197	4,197	4,197
2	UGRD	Arts & Science	1_STG	DOMESTIC	FT	Bachelor Degree 3yr	165	383	2	13																
2	UGRD	Arts & Science	1_STG	INTERNATIONAL	FT	Bachelor Degree	357	436	532	538	757	763	653	734	793	838	846	1,002	1,092	1,102	1,102	1,102	1,102	1,102	1,102	1,102
2	UGRD	Arts & Science	1_STG	INTERNATIONAL	FT	Bachelor Degree 3yr	28	52	4	9																

**Appendix 21 - Funded Cohort Rules**

<b>Arts &amp; Science St. George Graduate Department</b>	<b>Doctoral Stream Masters</b>	<b>Professional Masters</b>	<b>Doctoral</b>
Anthropology	1	0	4
Astronomy	1	0	4
Botany	1	0	4
European, Russian & Eurasian Studies	0	0	0
Environmental Science	1	0	0
Chemistry	1	0	4
Cinema Studies	1	0	0
Classical Studies	1	0	4
Comparative Literature	1	0	4
Criminology	0	0	5
Cell and Systems Biology	1	0	4
Computer Science	1	0	4
Drama	0	0	5
East Asian Studies	0	0	5
Economics	1	0	4
Ecology and Evolutionary Biology	1	0	4
English	0	0	5
History of Art	0	0	5
French Lang & Lit	0	0	5
German Lang & Lit	0	0	5
Gerontology	0	0	0
Geography	1	0	4
Geology	1	0	4
History	0	0	5
Hist & Phil of Sci & Tech	1	0	4
Industrial Relations	0	0	5
Italian Studies	0	0	5
Linguistics	1	0	4
Mathematics	1	0	4
Global Affairs	0	0	0
Mathematical Finance	0	0	0
Medieval Studies	0	0	5
Near & Middle Eastern Civilizations	0	0	5
Philosophy	1	0	4
Physics	1	0	4
Geography Planning	0	0	5
Political Science	0	0	5
Psychology	1	0	4
Religion	0	0	5
Slavic Lang & Lit	1	0	4
Sociology	1	0	4
Spanish & Portuguese	1	0	4
Public Policy	0	0	0
Statistics	1	0	4
Women & Gender Studies	1	0	0
Zoology	1	0	4

Appendix 31 - Finca Registration Table

#	Field	Array	Fields Used	Field Type	Field Length	Decimals	Description	ROSI table	ROSI table Description
1	REG_STS_EFF_DT	No	Y	A	10		Refers to effective date of the student's overall registration status in the session.	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).
2	CURR_REG_STS_CD (called "REG_STS_CD" in Arts & Science Extract)	No	Y	A	5		The status of a student's registration in a session (ex. Invited, interim, registered, cancelled, finca-ed, de-registered).	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).
3	SESSION_CD	No	Y	A	6		Identifies a study session. The first 4 digits represent the year, the 5th digit the month in which the session starts, the 6th digit is either blank or a character identifying a sub-session.	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).
4	PERSON_ID	No	Y	N	10	0	Uniquely identifies each student.	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).
5	GRAD_FUNDING_IND	No	Y	A	1		Identifies Y or N as to whether the student is eligible for the U of T funding guarantee package.	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).
6	APPLICANT_TYPE	No	Y	A	3		Prior type of educational institution a student attended. For example, "Ontario University" or "Nova Scotia Post-Sec".	SIS.APPLICANT	This table is used to record information about applicants for admission to the university.
7	STRIP(SURNAME,T,') "SURNAME"	No	Y	A	40		Last name	SIS.NAME_HIST	Contains the current & previous names.
8	STRIP(GIVEN_NAME,T,') "GIVEN_NAME"	No	Y	A	40		First name	SIS.NAME_HIST	Contains the current & previous names.
9	CURRENT_NAME_IND	No	Y	A	1		This field can have possible values of 'Y' or 'N'. Only records with a CURRENT_NAME_IND value of 'Y' are considered current and included in the MTCU extract.	SIS.NAME_HIST	This table contains the current name and any previous names.
10	ATTENDANCE_CLASS	No	Y	A	2		Code indicating whether a student is full-time or part-time.	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).
11	LEVEL_OF_INSTR	No	Y	A	1		Distinguishes between the undergraduate (U) and graduate (G) level.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program.
12	YEAR_OF_STUDY	No	Y	A	1		Identifies the year in a program of studies (0 pre-university, 1-4 undergraduate, 1-9 graduate).	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).

Appendix 31 - Finca Registration Table

#	Field	Array	Fields Used	Field Type	Field Length	Decimals	Description	ROSI table	ROSI table Description
13	LEG_STATUS	No	Y	A	1		the legal status comes from the SIS.NCAN table. If the person is not in the table, the legal status is Domestic. If the person is in the table, leg status codes of 0 (canadian citizen/native canadian) or 1 (permanent resident) correspond to Domestic. Values of 2,3,4,and 9 all are reported as International.	SIS.NCAN	This table contains citizenship and legal status information for non-Canadian students.
14	OVER_REG_FEE_CAT	No	Y	A	2		It is manually entered by a user only when they want to override the default legal status for a student (which would be either domestic or international). The possible override values are 'IE' for "international exempt" (meaning the student would normally pay international fees, but can pay at the domestic level for some reason) and 'EX' for "exempt" (which means the student is exempt from any academic fees).	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).
15	PRIMARY_ORG_CD	No	Y	A	5		Highest level organization indicating ownership (usually a division)	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
16	SECOND_ORG_CD	No	Y	A	5		secondary is the next order of ownership (usually a department)	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
17	CO_SEC_ORG_CD	No	Y	A	5		co-secondary is used when ownership is shared.	SIS.POST_OFFER	See above.
18	ASSOC_ORG_CD	No	Y	A	5		Used in Arts and Science to reflect college affiliation	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).
19	POST_CD	No	Y	A	10		Unique identifier of a program of study.	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).
20	SUBJECT_CD1	No	Y	A	3		Code identifying the subject of a subject post. For example, HIS is History.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program.
21	TUIT_FEE_POST_GRP	No	Y	A	5		Identifies a group of programs of study having the same tuition fees.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.

**Appendix 31 - Finca Registration Table**

#	Field	Array	Fields Used	Field Type	Field Length	Decimals	Description	ROSI table	ROSI table Description
22	TYPE_OF_PROGRAM	No	Y	A	5		Identifies the program of study, generally in terms of what it leads to (ex. Baccalaureate, Masters, PhD, Certificate).	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program.
23	FORMULA_POST_CAT	No	Y	A	3		MTCU formula post category.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
24	EXCHANGE_ID	No	Y	A	5		Identifier of an official exchange established between U of T and another university, country, or government agency.	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).

*Source: Column Reports: Attribute/Rolename/Column Information/Entity/Constraints (uft\_sis.er1, Tuesday, September 07, 1999)*

**Appendix 32 - Finca Subject Post Table**

#	Field	Array	Fields Used	Field Type	Field Length	Decimals	Description	ROSI table	ROSI table Description
1	PERSON_ID	No	Y	N	10	0	Uniquely identifies each student.	SIS.STUD_SUBJ_POST	The student subject post is the optional or variable subject concentration and specializations with which a student degree is associated.
2	START_SESSION_CD	No	Y	A	5		The session in which the student is considered to have officially started the subject POST.	SIS.STUD_SUBJ_POST	The student subject post is the optional or variable subject concentration and specializations with which a student degree is associated.
3	SESSION_COMPL_CD	No	Y	A	5		The session in which the student completed the subject post (if they have completed it).	SIS.STUD_SUBJ_POST	The student subject post is the optional or variable subject concentration and specializations with which a student degree is associated.
4	POST_CD "SUBJ_POST"	4	Y	A	10		An area of study that is associated with a degree, and denotes an area of specialization (for example, a student taking an Honours BA in Economics and Computer Science would have two subject posts)	SIS.STUD_SUBJ_POST	The student subject post is the optional or variable subject concentration and specializations with which a student degree is associated.
5	STUDENT_STATUS_CD	4	Y	A	3		The student's status in the POST: ACT- means active and the POST is 'in progress', CMP - means the POST is completed, REQ - means the POST is a 'restricted' one to which the student has requested entry, INV - means that the student has been 'invited' to join a restricted POST and needs to confirm the invitation before being marked as active, REF - means refused, the student requested entry to a restricted subject POST and was refused. Only STUDENT_STATUS_CD of CMP, ACT, INV are included.	SIS.STUD_SUBJ_POST	The student subject post is the optional or variable subject concentration and specializations with which a student degree is associated.

Source: University of Toronto Student Information Systems

**Appendix 51 - ARTSC\_MTCU**

POST is an abbreviation for program of study.

Field	Array	Fields Used	Fields Used	Field Type	Decimals	USIS & OUAC Codes	Description	Table Source	Table Description
SESSION_CD Primary Key	No	Y	A	6		N/A	Identifies a study session. The first 4 digits represent the year, the 5th digit the month in which the session starts, the 6th digit is either blank or a character identifying a sub-session.	Summer, Fall, Winter of upcoming fall. In 2007-08, it consisted of sessions 20075, 20079, 20081	Summer, Fall, Winter of upcoming fall. In 2007-08, it consisted of sessions 20075, 20079, 20081
SESSION labelled SESS	No	N	A	2		SESHUN 050	IF (LEVEL_OF_INSTR = "U") set 21 for fall, 22 for winter, 78 for summer; IF (LEVEL_OF_INSTR = "G") set 21 for fall, 22 for winter, 33 for summer.	LEVEL_OF_INSTR from SIS.POST.	This table represents the master inventory of programs of study, and contains basic information for each program
PERSON_ID Primary Key	No	Y	N	10	0	STUDID 060	Uniquely identifies each student.	SIS.REG_STS	A history of the changes in a student's registration status.
POST_CD Primary Key	No	Y	A	10		N/A	Unique identifier of a program of study.	SIS.REG_STS	A history of the changes in a student's registration status.
POST_TITLE	No	N	A	70		N/A	A description of POST_CD.	SIS.POST_TITLE (Named POST_NAME in ARTSC_MTCU)	The english description or name of a POST_CD.
OFFERED_BY_INST	No	N	N	6	0	INSTIT 030	Identifies the institution that offers a program of study.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program.
REPORT_DT	No	N	A	6		REPDAY 040	This element is the actual date as of which the reported data are valid, in the form DDMMYY.	Calculated field, no direct table source.	
LEG_STATUS	No	Y	A	1		IMSTAT 120	the legal status comes from the SIS.NCAN table. If the person is not in the table, the legal status is Domestic. If the person is in the table, leg status codes of 0 (canadian citizen/native canadian) or 1 (permanent resident) correspond to Domestic. Values of 2,3,4,and 9 all are reported as International.	SIS.NCAN	This table contains citizenship and legal status information for non-Canadian students.
CITIZEN_COUNTRY_CD	No	N	A	5		CUNCIT 130	Country of citizenship.	SIS.NCAN	This table contains citizenship and legal status information for non-Canadian students.
ENTERED_CANADA_DT	No	N	A	4		ENTRYD 140	The date which a student entered Canada.	SIS.NCAN	This table contains citizenship and legal status information for non-Canadian students.

**Appendix 51 - ARTSC\_MTCU**

POST is an abbreviation for program of study.

Field	Array	Fields Used	Fields Used	Field Type	Decimals	USIS & OUAC Codes	Description	Table Source	Table Description
CURR_INST_STS	No	N	A	1		CURSTAT 170	This field indicates whether or not the student has previously been registered at the institution. If the student has not previously registered then move a value of '3' to the Current Status field (new student). If the student has previously registered but the last registration was more than three sessions ago, then move a value of '2' to the Current Status field (re-entering student). If the student has previously registered and the last registration was not more than three sessions ago, then move a value of '1' to Current Status field (returning/ongoing student).	Calculated field, no direct table source.	
STATUS_LVL	No	Y	A	1		LEVSTAT 175	This element identifies the level of study status of students (e.g. whether students are entering for the first time or continuing in a level of study.	See TYPE_OF_PROGRAM and STATUS_LVL attachments.	
SIN	No	N	N	9	0	SIN 070	Social insurance number.	SIS.PERSON	A table containing biographical information for a student.
GENDER	No	Y	A	1		SEX 080	Male or Female.	SIS.PERSON	A table containing biographical information for a student.
BIRTH_DT	No	Y	A	10		BIRTHD 090	Birthday.	SIS.PERSON	A table containing biographical information for a student.
MARITAL_STS	No	Y	A	1		MARIST 100	Marital status.	SIS.NAME_HIST	Contains the current & previous names.
MOTHER_TONGUE	No	Y	A	1		TONGUE 110	First language spoken at home.	SIS.PERSON	A table containing biographical information for a student.
SURNAME	No	Y	A	40		N/A	Last name.	SIS.NAME_HIST	Contains the current & previous names.
GIVEN_NAME	No	Y	A	40		N/A	First name.	SIS.NAME_HIST	Contains the current & previous names.
COUNTRY	No	Y	A	5		CUNRES 150	Country of permanent address.	SIS.PERSON_ADDR	Permanent and mailing address information for students.
PROVINCE	No	Y	A	2		PRORES 155	Province of permanent address.	SIS.PERSON_ADDR	Permanent and mailing address information for students.

**Appendix 51 - ARTSC\_MTCU**

*POST is an abbreviation for program of study.*

Field	Array	Fields Used	Fields Used	Field Type	Decimals	USIS & OUAC Codes	Description	Table Source	Table Description
COUNTY	No	Y	A	2		COURES 160	County of permanent address.	SIS.PERSON_ADDR	Permanent and mailing address information for students.
POSTAL_CD	No	Y	A	12		N/A	Postal code of permanent address.	SIS.PERSON_ADDR	Permanent and mailing address information for students.
EDU_ACTIVITY_LAST_YR	No	N	A	2		EDUACT 171	This field indicates the educational activity of students registering at the institution this year at the time of the report to Statistics Canada last year.	See EDU_ACTIVITY_LAST_YR attachment	
REG_STS_STUDENT	No	N	A	2		REGIST 190	See TYPE_OF_PROGRAM and REG_STS_STUDENT attachments.		
USIS_QUALIF_LEVEL	No	N	N	2	0	QUALIF 210	Identifies level of qualification that results from a program of study (e.g. undergraduate, graduate).	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
USIS_DEG_AWARD_BOD	No	N	N	1	0	AWABOD 220	Identifies the university that awards the degree, certificate or diploma.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
USIS_SECOND_QUALIF	No	N	N	3	0	QUAJOI 235	Identifies the second qualification that results from a program of study.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
USIS_QUALIF_CODE	No	N	N	3	0	QUACOD 240	Identifies the degree that is associated with a program of study (e.g. 800 represents a diploma or certificate).	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
HONOURS_PROG_IND	No	N	N	1	0	HONIND 250	a) If TYPE_OF_PROGRAM is "BACC" then Honours = 4. b) If TYPE_OF_PROGRAM is "BACS" then Honours = 3. c) If TYPE_OF_PROGRAM is PROF1 PROF2 or PFBAC then Honours = 4 d) In all other cases, Honours = equal to 8.	Derived from TYPE_OF_PROGRAM field from SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program
USIS_SPEC_MAJ	No	N	N	5	0	SPEMAJ 260	Identifies the specialization or major field of study for a program of study.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
USIS_JOINT_SPEC	No	N	N	5	0	SPEJOI 270	Indicates that a program of study offers specialization in two fields of study.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.

**Appendix 51 - ARTSC\_MTCU**

*POST is an abbreviation for program of study.*

Field	Array	Fields Used	Fields Used	Field Type	Decimals	USIS & OUAC Codes	Description	Table Source	Table Description
TYPE_SESSION	No	N	N	2	0	SESTYP 280	Initialize to '11' (academic year). If PRIMARY_ORG_CD = 'SCAR' or 'TST', set to '32' (trimester).	Derived from PRIMARY_ORG_CD from SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
USIS_SESTOT	No	N	N	2	0	SESTOT 290	This field is the total number of sessions normally required to complete the student's program.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
SESSION_LVL	No	Y	N	2	0	SESLEV 300	This field is the stage of study in which the undergraduate student is currently registered. This field is read from the POST_OFFER table. If it does not exist, use YEAR_OF_STUDY.	SIS.POST_OFFER	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).
NORMAL_COMPL_YRS	No	N	N	1	0	N/A	Identifies the normal number of academic years to complete the program of study.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
MIN_CREDITS_RQD	No	N	N	3	0	N/A	The minimum number of credits to complete the program of study.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
FEE_CATEGORY	No	N	N	1	0	FEECAT 700	This field denotes operating formula funding eligibility and the fee category into which the student falls, as defined by the MTCU and used by Enrolment Reporting Officers in Ontario.	Calculated field, no direct table source.	
REG_FEE_CAT	No	N	A	2		N/A	This field denotes the default legal status for a student (which would be either Domestic (D) or International (I) or (EX) exempt). Students with an 'EX' are exempt from any academic fees.	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).
SESSION_FIRST_REG_UT	No	N	A	6		N/A	The session of first registration at U of T.	Select smallest session from SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).
ADV_STAND_FIRST_REG_IND	No	N	A	1		N/A	First session of advanced standing.	Select smallest session from SIS.REG, SIS.ADVST_COOR, SIS.ADVST_SUBJ	

**Appendix 51 - ARTSC\_MTCU**

*POST is an abbreviation for program of study.*

Field	Array	Fields Used	Fields Used	Field Type	Decimals	USIS & OUAC Codes	Description	Table Source	Table Description
START	No	N	A	3		START 715	Using the session of first registration at U of T check if the student had any courses starting with the letters TRF in their first session. If they do, set START to 999. Otherwise the first two characters of START is the year from first reg session (ie for 19979 it would be 97). The last character depends upon the first term of the first registration. First term is fall, last character of START is a '1'. First term is winter, last character of START is a '2' First term is summer, Formula Post Category is > 200 and < 400 (graduate studies) START is '5' First term is summer and student is undergrad (not set above) START is set to '8'.	Select smallest session from SIS.REG, look at activities on SIS.ACTIVITY, select FORMULA_POST_CAT from SIS.POST_OFFER.	Individual table definitions throughout the attachment.
APPLICANT_TYPE	No	Y	A	3		N/A	Prior type of educational institution a student attended. For example, "Ontario University" or "Nova Scotia Post-Sec" as opposed to the name of any specific institution.	SIS.APPLICANT	This table is used to record information about applicants for admission to the university.
TYPE_OF_PROGRAM	No	Y	A	5		N/A	Identifies the program of study, generally in terms of what it leads to (ex. Baccalaureate, Masters, PhD, Certificate).	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program
PRIMARY_ORG_CD	No	Y	A	5		N/A	Highest level organization indicating ownership (usually a division).	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
PRIMARY_ORG_DESC	No	N	A	65		N/A	A description of PRIMARY_ORG_CD.	SIS.ORG_NAME	A table that records the names of an organization in ROSI over time.
ASSOC_ORG_CD	No	Y	A	5		N/A	Used in Arts and Science to reflect college affiliation.	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).

**Appendix 51 - ARTSC\_MTCU**

*POST is an abbreviation for program of study.*

Field	Array	Fields Used	Fields Used	Field Type	Decimals	USIS & OUAC Codes	Description	Table Source	Table Description
ASSOC_ORG_DESC	No	N	A	65		N/A	A description of ASSOC_ORG_DESC.	SIS.ORG_NAME	A table that records the names of an organization in ROSI over time.
POST_MCU_FUND_IND	No	N	A	1		N/A	Indicates whether or not a program of study is eligible for funding by the MTCU.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
EXCHANGE_ID	No	Y	A	5		N/A	Identifier of an official exchange established between U of T and another university, country, or government agency.	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).
EXCHANGE_IN_OUT_CD	No	N	A	1		N/A	Denotes whether a student is an incoming or outgoing exchange student.	SIS.EXCHANGE	This table represents an inventory of student exchange agreements with other institutions.
FULL_COST_REC_IND	No	N	A	1		N/A	Indicates those exchange programs for which MTCU funding does not apply.	SIS.EXCHANGE	This table represents an inventory of student exchange agreements with other institutions.
OUAC_REFERENCE_NR labelled OUAC_REF_NR	No	N	A	11		REFNO 020	Unique reference number assigned by OUAC.	SIS.CANDIDACY	A record of the programs to which an applicant has applied at the University of Toronto.
OUAC_APPLICAT_NR	No	N	N	2	0	APPLNO 030	The number on an applicant's OUAC application form.	SIS.CANDIDACY	A record of the programs to which an applicant has applied at the University of Toronto.
OUAC_PROGRAM_CD	No	N	A	3		UPREG 715	Identifies the applicant's desired program.	SIS.CANDIDACY	A record of the programs to which an applicant has applied at the University of Toronto.
REGIST_TYPE	No	N	A	1		TYPREG 730	If the OUAC reference number is not blank the REGIST_TYPE is '1'. If the year of study is zero the REGIST_TYPE is '3'. If the year of study is '1' the REGIST_TYPE is '2'. When none of these conditions are met the REGIST_TYPE is reset.	Derived from OUAC_REFERENCE_NR from SIS.CANDIDACY.	A record of the programs to which an applicant has applied at the University of Toronto.
REGIST_YR	No	N	A	1		YRREG 735	When REGIST_TYPE is not blank if the year of study is '0', '1', or '2' the REGIST_YEAR equals the year of study; if the year of study is another value the REGIST_YEAR = '2'. If none of these conditions exist the REGIST_YEAR is reset.	Derived from REGIST_TYPE which is derived from OUAC_REFERENCE_NR from SIS.CANDIDACY.	A record of the programs to which an applicant has applied at the University of Toronto.

**Appendix 51 - ARTSC\_MTCU**

*POST is an abbreviation for program of study.*

Field	Array	Fields Used	Fields Used	Field Type	Decimals	USIS & OUAC Codes	Description	Table Source	Table Description
ATTENDANCE_CLASS	No	Y	A	2		N/A	Code indicating whether a student is full-time or part-time.	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).
LEVEL_OF_INSTR	No	Y	A	1		N/A	Distinguishes between the undergraduate (U) and graduate (G) level.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program
YEAR_OF_STUDY	No	Y	A	1		N/A	Identifies the year in a program of studies (0 pre-university, 1-4 undergraduate, 1-9 graduate).	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).
BASIS_OF_ADM_EQUIV	No	N	A	1		N/A	For a doctorate program, identifies whether the student was admitted with a bachelor's equivalent or a master's equivalent. This is used for the purpose of establishing full-time residency requirements.	SIS.STUD_POST	A record of Degree POST information that applies to a particular student.
SECOND_ORG_CD	No	Y	A	5		N/A	secondary is the next order of ownership (usually a department)	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
SECOND_ORG_DESC	No	N	A	65		N/A	A description of SECOND_ORG_CD.	SIS.ORG_NAME	A table that records the names of an organization in ROSI over time.
CO_SEC_ORG_CD	No	Y	A	5		N/A	co-secondary is used when ownership is shared	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
CO_SEC_ORG_DESC	No	N	A	65		N/A	A description of CO_SEC_ORG_CD.	SIS.ORG_NAME	A table that records the names of an organization in ROSI over time.
BLOCK_GRANT_IND	No	N	A	1		N/A	This field refers to whether MTCU funding is by activities or by program, i.e. by block. The field is set-up by our department responsible for MTCU reporting and is passed to them in the MTCU extract.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
FORMULA_POST_CAT	No	Y	A	3		FORPOS 705	MTCU formula post category.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.

**Appendix 51 - ARTSC\_MTCU**

*POST is an abbreviation for program of study.*

Field	Array	Fields Used	Fields Used	Field Type	Decimals	USIS & OUAC Codes	Description	Table Source	Table Description
LATEST_GPA	No	Y	N	3	2	N/A	The cumulative GPA	SIS.STUD_GPA	This table stores grade point averages (including cumulative grade point averages) for a student.
USIS_COMPCR	No	N	N	4	0	COMPCR 330	Total credits that the student has. If a value of COMPCR is set on the POST_OFFER, use it. Otherwise add up all the credits that the student has in their activity and advance standing tables.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
USIS_NORMCR	No	N	N	4	0	NORMCR 310	This element refers to the entire program of study e.g. to title (including whether or not student in honours program) and specialization. If some specializations require longer than others, reflect this in coding.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
ADMIN_ORG_CD	No	N	A	5		N/A	An organization with some kind of "administrative" function on the degree post that the division wanted to associate with the subject post.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
ADMIN_ORG_DESC	No	N	A	65		N/A	A description of ADMIN_ORG_CD.	SIS.ORG_NAME	A table that records the names of an organization in ROSI over time.
SCIENCE_CREDITS	No	Y	N	4	2	N/A	A count of science credits. When the PRIMARY_ORG of the POST_CD is ARTSC, ERIN or SCAR count the number of credits in their activity and advance standing records where the secondary org of the activity is a science one.	Sums them up on SIS.REG_ACT and SIS.ADVST_COUR_OBJ	SIS.ADVST_COUR_OBJ tracks courses where advanced standing has been given.
SENIOR_CREDITS	No	Y	N	4	2	N/A	A count of senior credits. When the primary org of the POST_CD is ARTSC, ERIN or SCAR count the number of credits where the activity is a level 300 or greater.	Sums them up on SIS.REG_ACT and SIS.ADVST_COUR_OBJ	SIS.ADVST_COUR_OBJ tracks courses where advanced standing has been given.
POST_MIN_BIU	No	N	N	5	3	N/A	Minimum cumulative BIU allowed in the program.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.

**Appendix 51 - ARTSC\_MTCU**

*POST is an abbreviation for program of study.*

Field	Array	Fields Used	Fields Used	Field Type	Decimals	USIS & OUAC Codes	Description	Table Source	Table Description
POST_MAX_BIU	No	N	N	5	3	N/A	Maximum cumulative BIU allowed in the program.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
REG_STS_CD	No	Y	A	5		N/A	The status of a student's registration in a session (ex. Invited, interim, registered, cancelled, finca-ed, de-registered).	SIS.REG_STS	A history of the changes in a student's registration status.
SOURCE_CD	No	N	A	2		N/A	Identifies the origin of a candidacy (e.g. university application form, OUAC application form, SGS, etc.	SIS.CANDIDACY	A record of the programs to which an applicant has applied at the University of Toronto.
CURR_CAND_STS_CD	No	Y	A	3		N/A	Current candidacy status in the admissions process.	SIS.CANDIDACY	A record of the programs to which an applicant has applied at the University of Toronto.
GRAD_FUNDING_IND	No	N	A	1		N/A	Identifies Y or N as to whether the student is eligible for the U of T funding guarantee package.	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).
TUIT_FEE_POST_GRP	No	N	A	5		N/A	Identifies a group of programs of study having the same tuition fees.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
DEGREE_CD	No	N	A	4		N/A	Identifies the degree a student is pursuing.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program
DEGREE_DESC	No	N	A	65		N/A	A description of DEGREE_DESC.	SIS.DEGREE_POST (named SIS.DEGREE in SIS original mapping).	Program of study degree. This table contains valid values for degrees which are part of the POST_CD.
SUBJECT_CD1	No	N	A	3		N/A	The first (or highest) level subject area of a degree post.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program
SUBJECT_CD1_DESC	No	N	A	40		N/A	A description of SUBJECT_CD1.	SIS.SUBJECT	A definition of subject codes as used in ROSI.
DESIGNATION_CD1	No	N	A	3		N/A	The designation of a degree post area, i.e. "major", "minor", "specialist", etc.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program

**Appendix 51 - ARTSC\_MTCU**

*POST is an abbreviation for program of study.*

Field	Array	Fields Used	Fields Used	Field Type	Decimals	USIS & OUAC Codes	Description	Table Source	Table Description
DESIGNATION_CD1_DESC	No	N	A	40		N/A	A description of DESIGNATION_CD1.	SIS.DESIGNATION	A definition of designation codes as used in ROSI.
SUBJECT_CD2	No	N	A	3		N/A	Same as SUBJECT_CD1, but this is the second level subject area/specialization of a degree post.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program
SUBJECT_CD2_DESC	No	N	A	40		N/A	A description of SUBJECT_CD1.	SIS.SUBJECT	A definition of subject codes as used in ROSI.
DESIGNATION_CD2	No	N	A	3		N/A	The designation of a second degree post subject area, i.e. "major", "minor", "specialist", etc.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program
DESIGNATION_CD2_DESC	No	N	A	40		N/A	A description of DESIGNATION_CD2.	SIS.DESIGNATION	A definition of designation codes as used in ROSI.
SUBJECT_CD3	No	N	A	3		N/A	Same as SUBJECT_CD1, but this is the third level subject area/specialization of a degree post.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program
SUBJECT_CD3_DESC	No	N	A	40		N/A	A description of SUBJECT_CD1.	SIS.SUBJECT	A definition of subject codes as used in ROSI.
DESIGNATION_CD3	No	N	A	3		N/A	The designation of a third degree post subject area, i.e. "major", "minor", "specialist", etc.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program
DESIGNATION_CD3_DESC	No	N	A	40		N/A	A description of DESIGNATION_CD3.	SIS.DESIGNATION	A definition of designation codes as used in ROSI.
FIELD_OF_STUDY	No	N	A	5		N/A	At the undergraduate level this currently is equivalent to PROGRAM_CD and refers to the MTCU reported area, i.e. ARTS, SCIENCE, COMMERCE, GENERAL. In future this may be changed to further break up these into subdivisions such as 'Humanities' under the more general ARTS area. At the graduate level this is assigned by SGS and refers to the OCGS field.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program

**Appendix 51 - ARTSC\_MTCU**

*POST is an abbreviation for program of study.*

Field	Array	Fields Used	Fields Used	Field Type	Decimals	USIS & OUAC Codes	Description	Table Source	Table Description
PROGRAM_CD	No	N	A	5		N/A	At the undergraduate level this refers to the MTCU reported area for a degree post, i.e. ARTS, SCIENCE, COMMERCE, GENERAL. At the Graduate level this is assigned by SGS and refers to the OCGS program.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program
CO_SPON_INST_ID	No	N	A	6		N/A	Identifies an institution (e.g. university, college, etc.) that is a co-sponsor of a program of study or an academic activity.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program
UPGRADE_DEGREE_IND	No	N	A	1		N/A	This is a yes/no field that is used to indicate whether or not the degree post (post_cd) will automatically create a new registration in a new degree post as defined in the graduation post change table in ROSI (1 A A H) when a degree conferral date is recorded for a student. If this is set to 'Y' then the student will be moved into the 'upgrade' degree listed in ROSI once they have convocated from their existing degree post.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program
INST_TYPE_OF_PROG	No	N	A	5		N/A	This refers to the type of program for the degree post.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
SELF_FUND_IND	No	N	A	1		N/A	Indicates whether or not the program of study is 'self-funded'. Any fees collected for the program go directly to the division that owns the program of study.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
COOP_IND	No	N	A	1		N/A	Indicates (Y or N) whether or not the degree post is offered in a cooperative education mode and requires the student to perform co-op work terms.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program

**Appendix 51 - ARTSC\_MTCU**

*POST is an abbreviation for program of study.*

Field	Array	Fields Used	Fields Used	Field Type	Decimals	USIS & OUAC Codes	Description	Table Source	Table Description
THESIS_RQT_OPT_CD	No	N	A	3		N/A	Indicates whether the student has chosen the thesis or the non-thesis option of the program where applicable.	SIS.STUD_POST	A record of Degree POST information that applies to a particular student.
CANDIDACY_SESS_CD	No	Y	A	6		N/A	The session of admission.	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).
CANDIDACY_POST_CD	No	N	A	10		N/A	Identifies the original formal candidacy applicable to the current registration.	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).
REG_STS_EFF_DT	No	Y	A	10		N/A	Refers to the student's overall registration status in the session. It is the actual date the registration status was entered or back dated.	SIS.REG_STS	A history of the changes in a student's registration status.
REG_STS_DT	No	Y	A	10		N/A	The actual date that a person enters the registration status onto the student's record.	SIS.REG_STS	A history of the changes in a student's registration status.
OVER_REG_FEE_CAT	No	Y	A	2		N/A	It is manually entered by a user only when they want to override the default legal status for a student (which would be either domestic or international). The possible override values are 'IE' for "international exempt" (meaning the student would normally pay international fees, but can pay at the domestic level for some reason) and 'EX' for "exempt" (which means the student is exempt from any academic fees).	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).
OTHER_POST_CD	No	Y	A	10		N/A	The post_cd associated with a dual registration in which one record is in another division.	SIS.REG_STS	A history of the changes in a student's registration status.
OTHER_ATTENDANCE_CLASS	No	Y	A	2		N/A	The ATTENDANCE_CLASS of a dual registration where one record is in another division.	SIS.REG	This table contains student registration data on a sessional basis (one row corresponds to one student and one session).

**Appendix 51 - ARTSC\_MTCU**

*POST is an abbreviation for program of study.*

Field	Array	Fields Used	Fields Used	Field Type	Decimals	USIS & OUAC Codes	Description	Table Source	Table Description
TUITION_AMT_SIGN	No	N	A	1		N/A	Stores "+" if the tuition amount below is positive; "-" if the tuition amount below is negative.	Programmed in by SIS	
TUITION_AMT	No	Y	N	9	2	N/A	The amount of tuition paid.	SIS.AR_TRAN	A historical record of all accounts receivable transaction information for a student.
EXMP_REASON_CD	No	Y	A	5		N/A	The reason that an International student is exempt from paying International fees.	SIS.INTL_EXEMPTION	A list of students granted a fees exemption along with the reason code for the exemption.
EXMP_REASON_DESC	No	N	A	40		N/A	A description of EXMP_REASON_CD.	SIS.EXMP_REASON	A table with definitions for the various fees exemption reason codes.
TUIT_FEE_POST_GRP labelled FEE_TUIT_FEE_POST_GRP	No	Y	A	5		N/A	Identifies a group of programs of study having the same tuition fees.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
SUBJECT_CD1 labelled FEE_POST_SUBJ_CD1	No	Y	A	3		N/A	Refers to the program of study (either degree or subject) that was used to determine fees.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program
EXTRACT_DT	No	Y	A	8		N/A	Date this extract was run.		

**Source:** *University of Toronto Student Information Systems*

## Appendix 51 - Type of Program (TYPE\_OF\_PROGRAM)

Type of Program	Definition
BACC	Direct Entry, Three-Year Bachelor's
BACS	Direct Entry, Four-Year Bachelor's
CEGEP	CEGEP Program
CERT	Certificate
COL	College Program (Community/other)
DIPCE	PLANNING&BUDGET use only:Diplomas&Certif
DIPL	Diploma-Graduate & Undergraduate
DOC	Doctoral Program
DOC1	Doctoral Program Direct (code is added internally by FAS, but not in ROSI)
MAST	Master's Program
OTH	Other
PDOC	Post Doctoral Fellows
PFBAC	Professional Bachelor's Program
PMAS	Professional Master's Program
PMED	Postgrad. Med.Int.,Resid.,Fellows
PREU	Pre-University
PRO	Profession Training Program
PROF1	Direct Entry, Bachelor's Program
PROF2	Second Entry Professional Program
PSPE	Special students requiring candidacy
QA	Additional Qualification
RES	Residents
RESPO	Residents and Postgrad Med
SEC	Secondary School
SPE	Special Students NOT requiring candidacy
SPE-O	PLANNING&BUDGET use only:Special-Other
SPE-V	PLANNING&BUDGET use only:Special-Visit
SPEC	PLANNING&BUDGET use only:Special
SPE2	Post Bachelor non-Degree Program
TEC	Technical Training
TECH	Technological Teaching Certificate
UG	Undergraduate Program
VISIT	Visiting (Graduate & Undergraduate)

**Source:** *University of Toronto Student Information Systems*

## Appendix 51 - Status Level (STATUS\_LVL)

- (a) If the TYPE\_OF\_PROGRAM is SPE, SPE2, VISIT or PSPE then set the Level of Status value to '4' (not applicable).
- (b) If the POST\_CD is one of the following then set the Level of Status value to '4' (not applicable);
  - MD DCC (Diploma in Clinical Chemistry)
  - MD DCP (Diploma in Child Psychiatry)
  - MD DPSY (Diploma in Psychiatry)
- (c) Determine if the student was previously registered.
  - (i) If the student was not previously registered then move a value of '1' to Level of Status (first time registered in a level of study).
  - (ii) If the student was previously registered and was in the same program of study (post\_cd) in the most recent previous registration then move a value of '2' to Level of Status (student continuing in a level of study).
  - (iii) If the student was previously registered and was not in the same program of study (post\_cd) in the most recent previous registration then obtain the TYPE\_OF\_PROGRAM of the post\_cd of the previous registration:

If the previous TYPE\_OF\_PROGRAM is "BACC" and the current TYPE\_OF\_PROGRAM is "BACS" or vice-versa then set the Level of Status to '2' (student continuing in a level of study).

In all other cases where the previous TYPE\_OF\_PROGRAM and the current TYPE\_OF\_PROGRAM are different, set the Level of Status value to '1' (first time registered in a level of study).

If the previous TYPE\_OF\_PROGRAM and the current TYPE\_OF\_PROGRAM are the same and the value is not 'MAST' or 'DOC' then set the Level of Status to '2' (student continuing in a level of study).

If the previous TYPE\_OF\_PROGRAM and the current TYPE\_OF\_PROGRAM are the same and the value is 'MAST' or 'DOC' then:

If the SECOND\_ORG\_CD of the previous post\_cd and the SECOND\_ORG\_CD of the current post\_cd are different then set the Level of Status to '3' (student continuing at the Master's or Doctorate level but in a new department or discipline).

If the SECOND\_ORG\_CD of the previous post\_cd and the SECOND\_ORG\_CD of the current post\_cd are the same then set the Level of Status to '2' (student continuing in a level of study).

**Source: University of Toronto Student Information Systems**

## Appendix 51 - Registration Status of the Student (REG\_STS\_STUDENT)

Derive this element using the following tables:

TYPE\_OF\_PROGRAM from SIS.POST  
MEDICAL\_CD from SIS.REG  
COOP\_IND from SIS.POST  
ATTENDANCE\_CLASS from SIS.REG

- (a) If the TYPE\_OF\_PROGRAM is PMED then:
  - if the MEDICAL\_CD = 'I' (intern) then set the Registration Status to '12'.
  - if the MEDICAL\_CD = 'R' (resident) then set the Registration Status to '13'
  - if the MEDICAL\_CD = 'A' (fellow) then set the Registration Status to '13'
  - if the MEDICAL\_CD is none of the above then set the Registration Status to blank and print an error message (1210). TBD how to handle 'pre-residence' students. These should also be assigned a Registration Status of '13'.
- (b) If the TYPE\_OF\_PROGRAM is not PMED then:
  - If the COOP\_IND is 'Y' and the ATTENDANCE\_CLASS is 'FT' (full-time) then set the Registration Status to 18.
  - If the COOP\_IND is 'Y' and the ATTENDANCE\_CLASS is 'PT' (part-time) then set the Registration Status to 28.
- (d) If the TYPE\_OF\_PROGRAM is not PMED and the COOP\_IND is not 'Y' then:
  - If the ATTENDANCE\_CLASS is 'FT' then set the Registration Status to '16'.
  - If the ATTENDANCE\_CLASS is 'PT' then set the Registration Status to '26'.

**Source:** *University of Toronto Student Information Systems*

## Appendix 51 - Educational Activity of Student Last Year (EDU\_ACTIVITY\_LAST\_YR)

If the SESSION\_CD is not a fall session then move '99' to the Educational Activity field. If the SESSION\_CD of the is a fall session then apply the logic below.

- (a) If the person was registered in the previous fall session and was Full-Time then set the Educational Activity value to '10'.

If the person was registered in the previous fall session and was Part-Time then set the Educational Activity value to '11'.

NOTE: Determine the previous fall session by subtracting 1 from the YYYY value of the session\_cd of the Workfile3 record (e.g. if the Workfile3 session\_cd is '19989' then the previous fall session is '19979'). The student must have a status of 'REG' on the SIS-REG row for this session in order for the above logic to apply. The student was full-time if the ATTENDANCE\_CLASS value on the SIS-REG row is 'FT' and part-time if the value is 'PT'.

- (b) If the person was not registered in the previous fall session then determine if there is a school history record (table SIS.SCOL\_HIST) where the person\_id matches the PERSON\_ID of the Workfile3 record, and the school history from year (scol\_hist\_from\_yr) and the school history to year (scol\_hist\_to\_yr), both of which are of the form YYYYMMDD, include December 1 of the previous year.

Example: if the session\_cd of the Workfile3 record is 19989 then determine if there is an SIS-SCOL\_HIST row for the person\_id where:

scol\_hist\_from\_yr <= 971201 and

scol\_hist\_to\_yr >= 971201.

If such a row is found, then use the value in the ADMISS\_INST\_ID of the row to read the table SIS-INSTITUTION and obtain the INSTITUTION\_LEVEL and the PROVINCE of the institution from this table. The INSTITUTION\_LEVEL will denote university, college, or secondary school. The required logic is as follows:

If the INSTITUTION\_LEVEL is "UNI" and the PROVINCE is "ON" then set Educational Activity to '20'.

If the INSTITUTION\_LEVEL is "UNI" and the PROVINCE is not "ON" then set Educational Activity to '21'.

If the INSTITUTION\_LEVEL is "COL" and the PROVINCE is "ON" then set Educational Activity to '30'.

If the INSTITUTION\_LEVEL is "COL" and the PROVINCE is not "ON" then set Educational Activity to '31'.

If the INSTITUTION\_LEVEL is "SEC" and the PROVINCE is "ON" then set Educational Activity to '40'.

If the INSTITUTION\_LEVEL is "SEC" and the PROVINCE is not "ON" then set Educational Activity to '41'.

- (c) If neither (a) nor (b) is applicable, then select the SIS-PERSON record where the person\_id is equal to the PERSON\_ID of the Workfile3 record, and select the DEC\_1\_UPDT\_DT and DEC\_1\_OCCUPATION values from this row.

If the DEC\_1\_UPDT\_DT is greater than or equal to the previous December 1 then:

If DEC\_1\_OCCUPATION = "98" (student was not attending school last year) or "99" (unknown) then Educational Activity = DEC\_1\_OCCUPATION.

If DEC\_1\_OCCUPATION = 01 (student, high school), or

02 (student, university), or

03 (student, college)

then write an error message (1209) and set Educational Activity equal to '99' (unknown).

- (d) If none of (a), (b), or (c) apply, then set Educational Activity equal to "99".

Note:

In point (c) it is necessary to determine whether the DEC\_1\_UPDT\_DT is prior to the previous December 1. For example, if the session\_cd is 19989 then the previous December 1 would be 1997-12-01.

The meaning of error message 1209 is that we know that the student was a student on the last December 1, but we do not know in which province, hence we cannot set the Educational Activity value.

**Source: University of Toronto Student Information Systems**

Appendix 52 - ARTSC\_SUBJECT\_POST

Field	Array	Fields Used	Field Type	Field Length	Decimals	Description	Table Source	Table Description
PERSON_ID Primary Key	No	Y	N	10	0	Uniquely identifies each student.	SIS.REG_STS	A history of the changes in a student's registration status.
POST_CD Primary Key	No	Y	A	10		Unique identifier of a program of study.	SIS.REG_STS	A history of the changes in a student's registration status.
SESSION_CD Primary Key	No	Y	A	6		Identifies a study session. The first 4 digits represent the year, the 5th digit the month in which the session starts, the 6th digit is either blank or a character identifying a sub-session.	SIS.REG_STS	A history of the changes in a student's registration status.
SUBJECT_POST_CD	4	Y	A	10		An area of study that is associated with a degree, and denotes an area of specialization (for example, a student taking an Honours BA in Economics and Computer Science would have two subject posts).	SIS.STUD_SUBJ_POST	The student subject post is the optional or variable subject concentration and specializations with which a student degree is associated.
FIELD_OF_STUDY	4	Y	A	5		At the undergraduate level this currently is equivalent to PROGRAM_CD and refers to the MTCU reported area for a subject post, i.e. ARTS, SCIENCE, COMMERCE, GENERAL. This has been changed to further break up these into subdivisions such as 'Humanities' under the more general ARTS area. At the graduate level this is assigned by SGS and refers to the OCGS field.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program.
POST_TITLE	4	N	A	70		A description of SUBJECT_POST_CD (same field exists on ARTSC_MTCU, but different definition).	SIS.POST_TITLE (Named POST_NAME in ARTSC_MTCU)	The english description or name of a POST_CD.
SUBJ_POST_CHRG	4	N	A	1		Indicates whether or not a subject post is considered 'chargeable'. If the value is 'Y' this means that higher fees are applied to a student record with active enrolment in this subject post.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.

Appendix 52 - ARTSC\_SUBJECT\_POST

Field	Array	Fields Used	Field Type	Field Length	Decimals	Description	Table Source	Table Description
STATUS_EFF_DT	4	N	A	10		The date that the subject post is recorded as effective onto the student's record.	SIS.STUD_SUBJ_POST	The student subject post is the optional or variable subject concentration and specializations with which a student degree is associated.
DESIGNATION_CD1	4	Y	A	3		The designation of a subject post subject area, i.e. "major", "minor", "specialist", etc.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program.
DESIGNATION_CD1_DESC	4	N	A	40		A description of DESIGNATION_CD1.	SIS.DESIGNATION	A definition of designation codes as used in ROSI.
SUBJECT_CD1	4	N	A	3		The first (or highest) level subject area of a subject post.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program.
SUBJECT_CD1_DESC	4	N	A	40		A description of SUBJECT_CD1.	SIS.SUBJECT	A definition of subject codes as used in ROSI.
SUBJECT_CD2	4	N	A	3		Same as SUBJECT_CD1, but this is the second level subject area/specialization of a subject post.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program.
SUBJECT_CD2_DESC	4	N	A	40		A description of SUBJECT_CD1.	SIS.SUBJECT	A definition of subject codes as used in ROSI.
SUBJECT_CD3	4	N	A	3		Same as SUBJECT_CD1, but this is the third level subject area/specialization of a subject post.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program.
SUBJECT_CD3_DESC	4	N	A	40		A description of SUBJECT_CD1.	SIS.SUBJECT	A definition of subject codes as used in ROSI.
PRIMARY_ORG_CD	4	N	A	5		Highest level organization indicating ownership (usually a division).	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
PRIMARY_ORG	4	N	A	65		A description of PRIMARY_ORG_CD.	SIS.ORG_NAME	A table that records the names of an organization in ROSI over time.
SECOND_ORG_CD	4	N	A	5		secondary is the next order of ownership (usually a department)	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
SECOND_ORG_DESC	4	N	A	65		A description of SECOND_ORG_CD.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
CO_SEC_ORG_CD	4	N	A	5		co-secondary is used when ownership is shared.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.

Appendix 52 - ARTSC\_SUBJECT\_POST

Field	Array	Fields Used	Field Type	Field Length	Decimals	Description	Table Source	Table Description
CO_SEC_ORG_DESC	4	N	A	65		A description of CO_SEC_ORG_CD.	SIS.ORG_NAME	A table that records the names of an organization in ROSI over time.
ADMIN_ORG_CD	4	N	A	5		An organization with some kind of "administrative" function on the subject post that the division wanted to associate with the subject post.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
ADMIN_ORG_DESC	4	N	A	65		A description of ADMIN_ORG_CD.	SIS.ORG_NAME	A table that records the names of an organization in ROSI over time.
COLL_ORG_CD	4	N	A	5		If the subject POST is part of a 'collaborative group' of many departments all offering a distinct program this is recorded here.	SIS.POST_OFFER	This table contains program of study information that is subject to change from session to session.
COLL_ORG_DESC	4	N	A	65		A description of COLL_ORG_CD.	SIS.ORG_NAME	A table that records the names of an organization in ROSI over time.
COOP_IND	4	N	A	1		Indicates (Y or N) whether or not the subject post is offered in a cooperative education mode and requires the student to perform co-op work terms.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program.
PROGRAM_CD	4	N	A	5		At the undergraduate level this refers to the MTCU reported area for a subject post, i.e. ARTS, SCIENCE, COMMERCE, GENERAL. At the Graduate level this is assigned by SGS and refers to the OCGS program.	SIS.POST	This table represents the master inventory of programs of study, and contains basic information for each program.
EXTRACT_DT	No	Y	A	10		Date this extract was run.	Date of the extract	
MINISTRY_CLAIM_IND	No	Y	A	1		Indicates whether students within an exchange program can be claimed for purposes of Government funding. The values are N (No) and Y (Yes).	SIS.EXCHANGE	This table stores information relevant to exchange programs the university is participating in.
THESIS_DT (THESIS_INFO_APP_DT in ROSI)	No	Y	A	10		Thesis approval date for a graduate student.	SIS.THESIS_TITLE	This table stores the official title of a student's thesis.

Source: University of Toronto Student Information Systems

**Appendix 53 - ARTSC\_ACTIVITY**

*POST is an abbreviation for program of study.*

Field	Array	Fields Used	Field Type	Field Length	Decimals	Description	Table Source	Table Description
SESSION_CD Primary Key	No	Y	A	6		Identifies a study session. The first 4 digits represent the year, the 5th digit the month in which the session starts, the 6th digit is either blank or a character identifying a sub-session.	Summer, Fall, Winter of upcoming fall. In 2007-08, it consisted of sessions 20075, 20079, 20081	Summer, Fall, Winter of upcoming fall. In 2007-08, it consisted of sessions 20075, 20079, 20081
PERSON_ID Primary Key	No	Y	N	10	0	Uniquely identifies each student.	SIS.REG_ACT_STS	A table that records the history of all changes in activity status for a student in each of their academic activities.
POST_CD Primary Key	No	Y	A	10		Unique identifier of a program of study.	SIS.REG_ACT_STS	A table that records the history of all changes in activity status for a student in each of their academic activities.
ACAD_ACT_CD	15	Y	A	8		Uniquely identifies each course.	SIS.REG_ACT_STS	A table that records the history of all changes in activity status for a student in each of their academic activities.
SECTION_CD	15	Y	A	2		Identifies the section of an academic activity.	SIS.REG_ACT_STS	A table that records the history of all changes in activity status for a student in each of their academic activities.
PRIME_TEACH_METHOD	15	N	A	3		Identifies the type of section meeting considered the primary meeting into which students must enroll before enrolling in the other meetings for this activity. Usually, this will be the lecture section meeting, but in some cases it may be the practical or tutorial section meeting.	SIS.REG_ACT_STS	A table that records the history of all changes in activity status for a student in each of their academic activities.
PRIME_SECTION_NR	15	N	A	6		The number of the meeting section for the activity for which student exists on the wait list.	SIS.REG_ACT_STS	A table that records the history of all changes in activity status for a student in each of their academic activities.
ACTIVITY_TITLE	15	N	A	30		The description of a course (ACAD_ACT_CD)	SIS.POST_TITLE (Named POST_NAME in ARTSC_MTCU)	The english description or name of a POST_CD.

**Appendix 53 - ARTSC\_ACTIVITY**

*POST is an abbreviation for program of study.*

Field	Array	Fields Used	Field Type	Field Length	Decimals	Description	Table Source	Table Description
OTH_TEACH_METHOD1	15	N	A	3		Identifies the type of section meeting for the first set of non-primary meetings into which this student is enrolled. These may be lecture, practical, or tutorial meetings.	SIS.REG_ACT_STS	A table that records the history of all changes in activity status for a student in each of their academic activities.
OTH_SECTION_NR1	15	N	A	6		The unique number for the first set of non-primary meetings into which the student has enrolled.	SIS.REG_ACT_STS	A table that records the history of all changes in activity status for a student in each of their academic activities.
OTH_TEACH_METHOD2	15	N	A	3		Identifies the type of section meeting for the second set of non-primary meetings into which this student is enrolled. These may be lecture, practical, or tutorial meetings.	SIS.REG_ACT_STS	A table that records the history of all changes in activity status for a student in each of their academic activities.
OTH_SECTION_NR2	15	N	A	6		The unique number for the second set of non-primary meetings into which the student has enrolled.	SIS.REG_ACT_STS	A table that records the history of all changes in activity status for a student in each of their academic activities.
ATTENDANCE_STS	15	N	A	3		Refers to the student's status in a course (i.e. what the student is taking the course for). The selection criteria include status of CRE (Credit) or APP (Additional) for science courses only.	SIS.REG_ACT	This table represents a picture of exactly what courses the student has on their record (regardless of whether they would be considered 'requested' or 'enrolled') at the time the data is pulled from ROSI.
ACAD_ACT_TYPE	15	N	A	6		Categorization of the different kinds of academic activities (e.g. course, test, work term, clinical work, practicum).	SIS.ACAD_ACT	A table that contains static information about an academic activity.
FULL_COUR_EQUIV_WT	15	Y	A	1		Indicates whether an activity carries a half weight (H) or a full weight (F).	SIS.ACT_OFFER	This table contains information about each activity that is subject to change from session to session.
CREDIT_IND	15	Y	A	1		Indicates whether an activity is a credit course by Y or N.	SIS.ACT_SEC_SES	The list of activities offered in a given session.
MAX_CREDIT	15	N	N	3	2	The maximum number of credits that a student can receive on passing an academic activity.	SIS.ACT_SEC_SES	The list of activities offered in a given session.
MIN_CREDIT	15	N	N	3	2	The minimum number of credits that a student can receive on passing an academic activity.	SIS.ACT_SEC_SES	The list of activities offered in a given session.

**Appendix 53 - ARTSC\_ACTIVITY**

*POST is an abbreviation for program of study.*

Field	Array	Fields Used	Field Type	Field Length	Decimals	Description	Table Source	Table Description
CREDITS	15	N	N	3	2	Identifies the weight of the activity used for GPA calculation.	SIS.REG_ACT	This table represents a picture of exactly what courses the student has on their record (regardless of whether they would be considered 'requested' or 'enrolled') at the time the data is pulled from ROSI.
ACAD_ACT_FUND_IND	15	Y	A	1		Indicates whether a course is eligible for MTCU funding by Y or N.	SIS.ACT_OFFER	This table contains information about each activity that is subject to change from session to session.
REG_SESSION1	15	N	A	6		The session in which the student must register for the section of an academic activity. For multi-session activities consecutive sessions will be identified.	SIS.ACT_SEC_SES	The list of activities offered in a given session.
REG_SESSION2	15	N	A	6		The session in which the student must register for the section of an academic activity. For multi-session activities consecutive sessions will be identified.	SIS.ACT_SEC_SES	The list of activities offered in a given session.
REG_SESSION3	15	N	A	6		The session in which the student must register for the section of an academic activity. For multi-session activities consecutive sessions will be identified.	SIS.ACT_SEC_SES	The list of activities offered in a given session.
PRIMARY_ORG_CD	15	N	A	5		Highest level organization indicating ownership (usually a division).	SIS.ACT_OFFER	This table contains information about each activity that is subject to change from session to session.
PRIMARY_ORG_DESC	15	N	A	65		A description of PRIMARY_ORG_CD.	SIS.ORG_NAME	A table that records the names of an organization in ROSI over time.
SECOND_ORG_CD	15	N	A	5		secondary is the next order of ownership (usually a department)	SIS.ACT_OFFER	This table contains information about each activity that is subject to change from session to session.
SECOND_ORG_DESC	15	N	A	65		A description of SECOND_ORG_CD.	SIS.ORG_NAME	A table that records the names of an organization in ROSI over time.
CONTINUE_IND	15	N	A	1		Indicates (Y or N) whether or not an academic activity normally continues from one session to the next (e.g. thesis preparation).	SIS.ACT_OFFER	This table contains information about each activity that is subject to change from session to session.
STATUS_EFF_DT	15	Y	A	10		The date that the academic activity status is recorded as effective onto the student's record, which allows for backdating.	SIS.REG_ACT_STS	A table that records the history of all changes in activity status for a student in each of their academic activities.

**Appendix 53 - ARTSC\_ACTIVITY**

*POST is an abbreviation for program of study.*

Field	Array	Fields Used	Field Type	Field Length	Decimals	Description	Table Source	Table Description
REG_ACAD_ACT_DT	15	Y	A	10		The actual date that a person enters the academic activity status onto the student's record.	SIS.REG_ACT_STS	A table that records the history of all changes in activity status for a student in each of their academic activities.
EXTRACT_DT	No	Y	A	8		Date this extract was run	Date of Extract	

**Source: University of Toronto Student Information Systems**

**Appendix 54 - ARTSC\_BIUS**

*POST is an abbreviation for program of study.*

Field	Array	Fields Used	Field Type	Field Length	Decimals	Description	Table Source	Table Description
PERSON_ID Primary Key	No	Y	N	10	0	Uniquely identifies each student.	SIS.REG_STS	A history of the changes in a student's registration status.
FORMULA_POST_CAT Primary Key	No	Y	N	3	0	MTCU formula post category.	SIS.BIUS	This table keeps track of cumulative BIUs for the purpose of determining eligibility for MTCU funding.
CLAIM_LEVEL	No	Y	N	1	0	Masters or PhD level	SIS.BIUS	This table keeps track of cumulative BIUs for the purpose of determining eligibility for MTCU funding.
BIUS	No	Y	N	7	3	Stores the cumulative BIUs for a given formula post category.	SIS.BIUS	This table keeps track of cumulative BIUs for the purpose of determining eligibility for MTCU funding.
CLAIM_STATUS	No	Y	A	1		O is over, E is eligible, I is ineligible.	SIS.BIUS	This table keeps track of cumulative BIUs for the purpose of determining eligibility for MTCU funding.
LAST_UPDATE	No	Y	A	6		Session that a record was last updated.	SIS.BIUS	This table keeps track of cumulative BIUs for the purpose of determining eligibility for MTCU funding.
EXTRACT_DT	No	Y	A	8		Date this extract was run.	Date of Extract	

**Source: University of Toronto Student Information Systems**

## Appendix 55 - ARTSC\_COMBINED

*POST is an abbreviation for program of study.*

Field	Array	Description
session_cd	No	Identifies a study session. The first 4 digits represent the year, the 5th digit the month in which the session starts, the 6th digit is either blank or a character identifying a sub-session.
sess	No	IF (LEVEL_OF_INSTR = "U") set 21 for fall, 22 for winter, 78 for summer; IF (LEVEL_OF_INSTR = "G") set 21 for fall, 22 for winter, 33 for summer.
person_id	No	Uniquely identifies each student.
grad_funding_ind	No	Identifies Y or N as to whether the student is eligible for the U of T funding guarantee package.
post_cd	No	Unique identifier of a program of study.
leg_status	No	the legal status comes from the SIS.NCAN table. If the person is not in the table, the legal status is Domestic. If the person is in the table, leg status codes of 0 (canadian citizen/native canadian) or 1 (permanent resident) correspond to Domestic. Values of 2,3,4,and 9 all are reported as International.
fee_category	No	This field denotes operating formula funding eligibility and the fee category into which the student falls, as defined by the MTCU and used by Enrolment Reporting Officers in Ontario.
reg_fee_cat	No	It is manually entered by a user only when they want to override the default legal status for a student (which would be either domestic or international). The possible override values are 'IE' for "international exempt" (meaning the student would normally pay international fees, but can pay at the domestic level for some reason) and 'EX' for "exempt" (which means the student is exempt from any academic fees).
status_lvl	No	See TYPE_OF_PROGRAM and STATUS_LVL attachments.

## Appendix 55 - ARTSC\_COMBINED

*POST is an abbreviation for program of study.*

Field	Array	Description
gender	No	Male or Female.
birth_dt	No	Birthday.
age	No	Age as of fall term.
marital_sts	No	Marital status.
mother_tongue	No	First language spoken at home.
surname	No	Last name.
given_name	No	First name.
country	No	Country of permanent address.
province	No	Province of permanent address.
county	No	County of permanent address.
postal_cd	No	Postal code of permanent address.
session_lvl	No	This field is the stage of study in which the undergraduate student is currently registered. This field is read from the POST_OFFER table. If it does not exist, use YEAR_OF_STUDY.
applicant_type	No	Prior type of educational institution a student attended. For example, "Ontario University" or "Nova Scotia Post-Sec" as opposed to the name of any specific institution.
type_of_program	No	Identifies the program of study, generally in terms of what it leads to (ex. Baccalaureate, Masters, PhD, Certificate).
primary_org_cd	No	Highest level organization indicating ownership (usually a division).
assoc_org_cd	No	Used in Arts and Science to reflect college affiliation.
exchange_id	No	Identifier of an official exchange established between U of T and another university, country, or government agency.
exchange_in_out_cd	No	Denotes whether a student is an incoming or outgoing exchange student.
attendance_class	No	Code indicating whether a student is full-time or part-time.
level_of_instr	No	Distinguishes between the undergraduate (U) and graduate (G) level.
year_of_study	No	Identifies the year in a program of studies (0 pre-university, 1-4 undergraduate, 1-9 graduate).
second_org_cd	No	secondary is the next order of ownership (usually a department)

## Appendix 55 - ARTSC\_COMBINED

*POST is an abbreviation for program of study.*

Field	Array	Description
co_sec_org_cd	No	co-secondary is used when ownership is shared
formula_post_cat	No	MTCU formula post category.
latest_gpa	No	The cumulative GPA
science_credits	No	A count of science credits. When the PRIMARY_ORG of the POST_CD is ARTSC, ERIN or SCAR count the number of credits in their activity and advance standing records where the secondary org of the activity is a science one.
senior_credits	No	A count of senior credits. When the primary org of the POST_CD is ARTSC, ERIN or SCAR count the number of credits where the activity is a level 300 or greater.
reg_sts_cd	No	The status of a student's registration in a session (ex. Invited, interim, registered, cancelled, finca-ed, de-registered).
curr_cand_sts_cd	No	Current candidacy status in the admissions process.
candidacy_sess_cd	No	The session of admission.
reg_sts_eff_dt	No	Refers to the student's overall registration status in the session. It is the actual date the registration status was entered or back dated.
reg_sts_dt	No	The actual date that a person enters the registration status onto the student's record.
over_reg_fee_cat	No	It is manually entered by a user only when they want to override the default legal status for a student (which would be either domestic or international). The possible override values are 'IE' for "international exempt" (meaning the student would normally pay international fees, but can pay at the domestic level for some reason) and 'EX' for "exempt" (which means the student is exempt from any academic fees).
other_post_cd	No	The post_cd associated with a dual registration in which one record is in another division.

**Appendix 55 - ARTSC\_COMBINED**

*POST is an abbreviation for program of study.*

<b>Field</b>	<b>Array</b>	<b>Description</b>
other_attendance_class	No	The ATTENDANCE_CLASS of a dual registration where one record is in another faculty.
tuition_amt	No	The amount of tuition paid.
exmp_reason_cd	No	The reason that an International student is exempt from paying International fees.
fee_tuit_fee_post_grp	No	Identifies a group of programs of study having the same tuition fees.
fee_post_subj_cd1	No	Refers to the program of study (either degree or subject) that was used to determine fees.
post_mcu_fund_ind	No	Indicates whether or not a program of study is eligible for funding by the MTCU.
full_cost_rec_ind	No	Indicates those exchange programs for which MTCU funding does not apply.
ministry_claim_ind	No	Indicates whether students within an exchange program can be claimed for purposes of Government funding. The values are N (No) and Y (Yes).
thesis_dt	No	Thesis approval date for a graduate student.
extract_dt	No	Date this extract was run.
subject_post_cd	4	An area of study that is associated with a degree, and denotes an area of specialization (for example, a student taking an Honours BA in Economics and Computer Science would have two subject posts).
program_cd	4	At the undergraduate level this refers to the MTCU reported area for a subject post, i.e. ARTS, SCIENCE, COMMERCE, GENERAL. At the Graduate level this is assigned by SGS and refers to the OCGS program.
acad_act_cd	15	Uniquely identifies each course.
section_cd	15	Identifies the section of an academic activity.
full_cour_equiv_wt	15	Indicates whether an activity carries a half weight (H) or a full weight (F).
credit_ind	15	Indicates whether an activity is a credit course by Y or N.

**Appendix 55 - ARTSC\_COMBINED**

*POST is an abbreviation for program of study.*

<b>Field</b>	<b>Array</b>	<b>Description</b>
acad_act_fund_ind	15	Indicates whether a course is eligible for MTCU funding by Y or N.
status_eff_dt	15	The date that the academic activity status is recorded as effective onto the student's record, which allows for backdating.
reg_acad_act_dt	15	The actual date that a person enters the academic activity status onto the student's record.
credits	15	Identifies the weight of the activity used for GPA calculation.
reg_session1	15	The session in which the student must register for the section of an academic activity. For multi-session activities consecutive sessions will be identified.
reg_session2	15	The session in which the student must register for the section of an academic activity. For multi-session activities consecutive sessions will be identified.
reg_session3	15	The session in which the student must register for the section of an academic activity. For multi-session activities consecutive sessions will be identified.

Appendix 56 - Finca Tables

Table	Program Call	Table Name	Selection Criteria	Data Type	Table Layout
1	finca_rates.sps	finca_degree_type.sav	week_reg >= now AND week_reg <= week_count	Finca Rate	t unit division campus dom_intl ftptrgst yr1vl degree_type_aggregate sector department degree_type finca_degree_type
2	finca_rates.sps	finca_department.sav	week_reg >= now AND week_reg <= week_count	Finca Rate	t unit division campus dom_intl ftptrgst yr1vl degree_type_aggregate sector department finca_degree_type
3	finca_rates.sps	finca_sector.sav	week_reg >= now AND week_reg <= week_count	Finca Rate	t unit division campus dom_intl ftptrgst yr1vl degree_type_aggregate sector finca_degree_type
4	finca_rates.sps	finca_degree_type_aggrega	week_reg >= now AND week_reg <= week_count	Finca Rate	t unit division campus dom_intl ftptrgst yr1vl degree_type_aggregate finca_degree_type
5	finca_rates.sps	finca_yr1vl.sav	week_reg >= now AND week_reg <= week_count	Finca Rate	t unit division campus dom_intl ftptrgst yr1vl finca_degree_type
6	finca_rates.sps	finca_ftptrgst.sav	week_reg >= now AND week_reg <= week_count	Finca Rate	t unit division campus dom_intl ftptrgst finca_degree_type
7	finca_rates.sps	finca_dom_intl.sav	week_reg >= now AND week_reg <= week_count	Finca Rate	t unit division campus dom_intl finca_degree_type

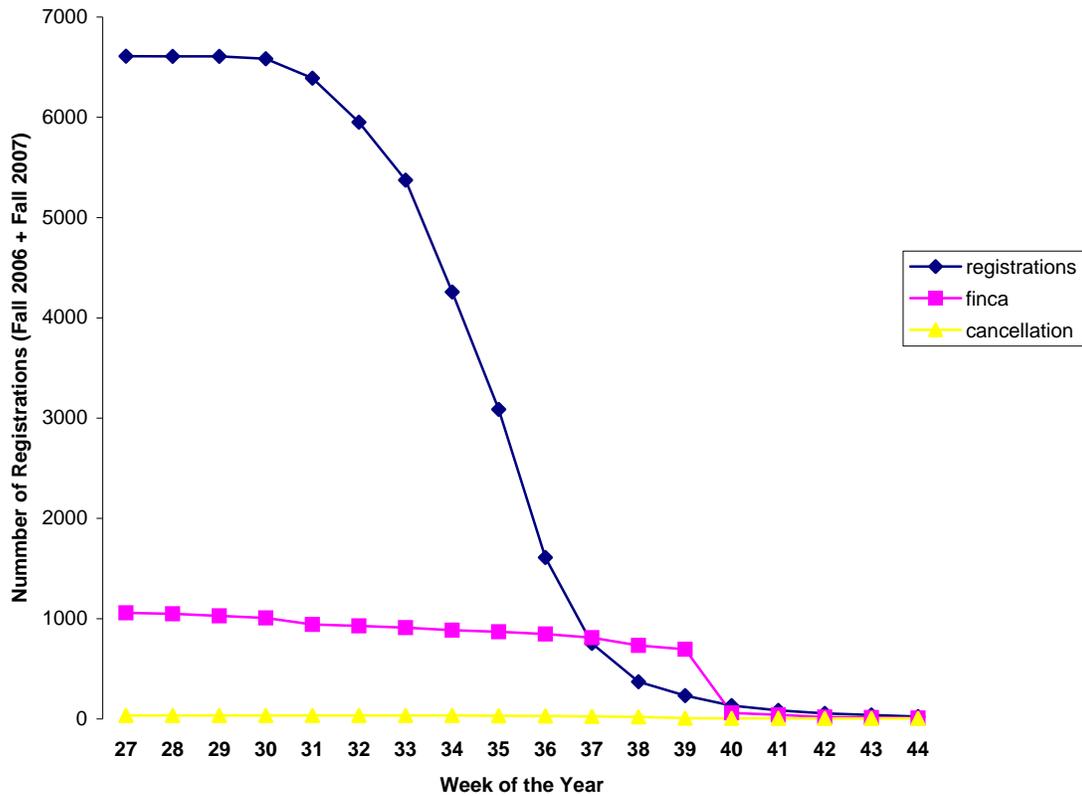
Appendix 56 - Finca Tables

Table	Program Call	Table Name	Selection Criteria	Data Type	Table Layout
8	cancel_rates.sps	cancel_degree_type.sav	now <= week_count If week_reg <= now then remove cancellations from population	Cancel Rate	t unit division campus dom_intl ftptrgst yr1vl degree_type_aggregate sector department degree_type cancel_degree_type
9	cancel_rates.sps	cancel_department.sav	now <= week_count If week_reg <= now then remove cancellations from population	Cancel Rate	t unit division campus dom_intl ftptrgst yr1vl degree_type_aggregate sector department cancel_degree_type
10	cancel_rates.sps	cancel_sector.sav	now <= week_count If week_reg <= now then remove cancellations from population	Cancel Rate	t unit division campus dom_intl ftptrgst yr1vl degree_type_aggregate sector cancel_degree_type
11	cancel_rates.sps	cancel_degree_type_aggre	now <= week_count If week_reg <= now then remove cancellations from population	Cancel Rate	t unit division campus dom_intl ftptrgst yr1vl degree_type_aggregate cancel_degree_type
12	cancel_rates.sps	cancel_yr1vl.sav	now <= week_count If week_reg <= now then remove cancellations from population	Cancel Rate	t unit division campus dom_intl ftptrgst yr1vl cancel_degree_type
13	cancel_rates.sps	cancel_ftptrgst.sav	now <= week_count If week_reg <= now then remove cancellations from population	Cancel Rate	t unit division campus dom_intl ftptrgst cancel_degree_type
14	cancel_rates.sps	cancel_dom_intl.sav	now <= week_count If week_reg <= now then remove cancellations from population	Cancel Rate	t unit division campus dom_intl cancel_degree_type

**Appendix 57 - Arts & Science Fall 2006 and Fall 2007  
FT Graduate Domestic Student Registration Behaviour**

month	week	registrations	finca	cancellation	Invited
July 1-7	27	6609	1058	35	7702
July 8-14	28	6608	1049	35	7692
July 15-21	29	6608	1028	35	7671
July 22-28	30	6584	1007	35	7626
July 29 - Aug 4	31	6390	943	35	7368
Aug 5-11	32	5952	928	35	6915
Aug 12-18	33	5373	910	35	6318
Aug 19-25	34	4259	885	35	5179
Aug 26-Sept 1	35	3087	869	32	3988
Sept 1-8	36	1610	848	30	2488
Sept 9-15	37	753	811	25	1589
Sept 16-22	38	371	733	20	1124
Sept 23-29	39	233	695	8	936
Sept 30 - Oct 6	40	133	61	7	201
Oct 6-13	41	85	41	6	132
Oct 13-20	42	55	19	5	79
Oct 21-27	43	39	14	5	58
Oct 28 - Nov 3	44	24	10	4	38

**Fall 2006 and Fall 2007 Registration Behaviour Chart**



FAS Enrolment Model Performance

14-Jan-11

Targets		Input Data Calibrated to end of 2001-02	Input Data Calibrated to end of 2002-03	Input Data Calibrated to end of 2003-04	Input Data Calibrated to end of 2004-05	Input Data Calibrated to end of 2005-06	Input Data Calibrated to end of 2006-07	Input Data Calibrated to end of 2007-08	Input Data Calibrated to end of 2008-09	Input Data Calibrated to end of 2009-10	Actual Revenue
2002-03 Targets	GRAD	53,799,495	53,176,715								53,176,715
	UGRD	90,035,307	189,688,814								189,688,814
2003-04 Targets	GRAD	55,718,496	57,373,169	53,982,704							53,982,704
	UGRD	89,920,461	166,862,239	213,779,186							213,779,186
2004-05 Targets	GRAD	62,568,347	65,635,040	62,758,038	55,005,093						55,005,093
	UGRD	92,995,245	163,516,768	227,427,108	230,503,975						230,503,975
2005-06 Targets	GRAD	66,250,802	71,856,198	68,044,870	61,744,542	57,889,497					57,889,497
	UGRD	97,633,258	168,361,420	244,307,384	247,711,496	246,448,647					246,448,647
2006-07 Targets	GRAD	71,111,307	75,569,666	73,314,397	68,113,323	64,895,370	61,785,433				61,785,433
	UGRD	95,840,888	171,550,750	248,332,692	253,451,931	257,578,995	251,258,854				251,258,854
2007-08 Targets	GRAD	87,469,906	92,663,725	89,745,482	85,115,242	82,573,179	79,021,726	77,209,390			77,209,390
	UGRD	106,195,793	192,432,618	274,675,384	284,684,786	284,716,816	283,827,675	277,735,264			277,735,264
2008-09 Targets	GRAD	92,602,534	99,469,172	95,852,633	92,402,577	89,982,662	86,244,767	84,610,308	83,675,539		83,675,539
	UGRD	110,923,622	192,396,997	278,959,444	287,566,069	292,748,913	289,095,927	291,180,952	283,161,142		283,161,142
2009-10 Targets	GRAD	96,908,980	103,449,375	99,804,305	93,901,885	94,141,302	90,620,865	88,373,218	88,807,270	87,252,861	87,252,861
	UGRD	122,885,445	208,835,926	296,179,758	303,303,160	307,587,791	306,815,163	305,717,154	305,794,699	301,617,453	301,617,453

FAS Enrolment Model Error Rate by Percentage

		Input Data Calibrated to end of 2001-02	Input Data Calibrated to end of 2002-03	Input Data Calibrated to end of 2003-04	Input Data Calibrated to end of 2004-05	Input Data Calibrated to end of 2005-06	Input Data Calibrated to end of 2006-07	Input Data Calibrated to end of 2007-08	Input Data Calibrated to end of 2008-09	Input Data Calibrated to end of 2009-10
2002-03 Targets	GRAD	1.17%								
	UGRD	-52.54%								
2003-04 Targets	GRAD	3.22%	6.28%							
	UGRD	-57.94%	-21.95%							
2004-05 Targets	GRAD	13.75%	19.33%	14.09%						
	UGRD	-59.66%	-29.06%	-1.33%						
2005-06 Targets	GRAD	14.44%	24.13%	17.54%	6.66%					
	UGRD	-60.38%	-31.68%	-0.87%	0.51%					
2006-07 Targets	GRAD	15.09%	22.31%	18.66%	10.24%	5.03%				
	UGRD	-61.86%	-31.72%	-1.16%	0.87%	2.52%				
2007-08 Targets	GRAD	13.29%	20.02%	16.24%	10.24%	6.95%	2.35%			
	UGRD	-61.76%	-30.71%	-1.10%	2.50%	2.51%	2.19%			
2008-09 Targets	GRAD	10.67%	18.87%	14.55%	10.43%	7.54%	3.07%	1.12%		
	UGRD	-60.83%	-32.05%	-1.48%	1.56%	3.39%	2.10%	2.83%		
2009-10 Targets	GRAD	11.07%	18.56%	14.39%	7.62%	7.89%	3.86%	1.28%	1.78%	
	UGRD	-59.26%	-30.76%	-1.80%	0.56%	1.98%	1.72%	1.36%	1.38%	