

ENROLLMENT PROJECTIONS  
UNIVERSITY OF HAWAI'I SYSTEM  
FALL 2013 TO FALL 2018

**ENROLLMENT PROJECTIONS  
UNIVERSITY OF HAWAII  
FALL 2013 TO FALL 2018**

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# **ENROLLMENT PROJECTIONS THE UNIVERSITY OF HAWAII FALL 2013 TO FALL 2018**

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## **INTRODUCTION**

This report provides a summary of the enrollment projections for the campuses of the University of Hawai'i system: the University of Hawai'i at Mānoa, the University of Hawai'i at Hilo, the University of Hawai'i-West O'ahu, and the University of Hawai'i Community Colleges: Hawai'i, Honolulu, Kapi'olani, Kaua'i, Leeward, Maui College, and Windward. Details of the enrollment projections by campus may be found in the separate reports by UH unit (UH Mānoa, UH Hilo, UH-West O'ahu and the UH Community Colleges).

The enrollment projections are based upon unduplicated headcounts of students enrolled in credit courses. Included are classified students in programs leading to a degree as well as unclassified students. Special students (early admits) have been included for all years, both historical and projected. Historical data are included in the tables and charts to facilitate comparison and analysis. They were extracted from the student enrollment, academic crossover, and course registration data files.

The projections are statistical extrapolations of current trends in enrollment by campus. They do not set enrollment targets and, in general, do not take into consideration planned or potential changes in University or campus policies or procedures. They should be considered as an extension into the future of current enrollment trends.

Beginning this year, the projection reports also make use of a time series analysis conducted by UH IRAO office staff that incorporates a variety of economic and demographic factors. This model has been used to guide and validate the projection methodology for the system-wide enrollment projections. ARIMA (time series) projections were made by UH unit. The analysis is attached to this report as an appendix.

## **PROJECTION METHODOLOGY**

The projections for classified undergraduates are sub-divided by registration status (also called student type): first-time, transfer, returning and continuing. Graduate and unclassified student enrollments are forecast separately. The projection methodology makes use of continuation rates as well as ratios, trends and constants. The specific methods used and assumptions made in forecasting enrollments vary for each campus. Details are found in the separate enrollment projection reports by UH unit.

The projection reports by unit have charts (Figure 3 in this report) which illustrate visually the upper and lower forecast boundaries. These boundaries are based upon the observed average percentage error in the forecast, as measured over the most recent ten year period. Note that the forecast error increases with time. For the UH system as a whole, the 1-year forecast error has averaged 1.9%, while the 6-year forecast error has averaged 7.7%. The projected numbers given here may be considered mid-level forecasts.

Table 1 presents historical and projected enrollments for each campus and for the UH system in aggregate from Fall 2007 to Fall 2018. Historical and projected enrollment by registration status at the UH system level are presented in Table 2. Annual percentage change in enrollment by campus is shown in Table 3. Table 4 provides enrollment indexes, useful for comparing across campuses, calculated using Fall 2012 as the base year. (An enrollment index is illustrated for the UH system in Figure 2 and for each UH unit in Figures 5 to 8.) Tables 5 and 6 show projected student semester hours (SSH) offered and full-time equivalent (FTE) course enrollment served, respectively. Projected enrollments by attendance status (full-time / part-time) are given in Table 7. Appendix A shows historical and projected enrollments of Hawai'i public high school seniors by geographic district. Appendix B gives forecasts of Hawai'i public and private high school graduates through academic year 2027-28.

## ANALYSIS AND DISCUSSION

- Headcount enrollment for the University of Hawai'i measured 60,295 in Fall 2012, a very slight (0.1%) decrease from the previous fall semester (Tables 1 & 3 and Figures 1 & 4). Enrollment increased at five campuses: UH-West O'ahu (20.2%); Kaua'i CC (4.3%); Windward CC (1.3%); Leeward CC (0.8%); UH Hilo (0.4%). Enrollment declined at five campuses: UH Mānoa (<-0.1%); Honolulu CC (-0.4%); Kapi'olani CC (-1.5%); Maui College (-3.2%); Hawai'i CC (-6.5%). Overall, the recent period of rapid growth in enrollment appears to have ended.
- **The forecast for the UH system projects a 0.1% decrease for Fall 2013, to 60,292 students, with subsequent annual growth through Fall 2018 averaging 0.4%.** This rate of growth would result in enrollment surpassing 61,500 by 2018 (Table 1). This forecast is lower than the enrollment projection made last year.
- The Hawai'i Department of Education forecast of public high school seniors calls for a 7.9% decline through school year 2015-16, with the number subsequently increasing 5.7% through 2017-18 (Appendix A). The outlook for private high school graduates, as forecast by the Western Interstate Commission for Higher Education (WICHE), is for

graduates to average around 2,760 through 2015-16, then to increase mildly through 2017-18 (Appendix B).

- The going rate (college participation rate) of Hawai'i public high school graduates into the UH system has been stable for the last four years at about 40%, while the private high school going rate has measured between 30% and 33.5% (see the MAPS report entitled: "High School Background of First-Time Students, University of Hawai'i, Fall 2012"). Given the forecasts in seniors and graduates, the first-time freshmen count will be stable to moderately declining through Fall 2016, with subsequent mild growth through Fall 2018.
- Since the admission of lower division students began in Fall 2007, enrollment growth at UH-West O'ahu has picked up. Enrollment has increased 131% since Fall 2006, increasing 20.2% in Fall 2012 alone. The addition of new facilities, which opened in Fall 2012, will help to sustain continued growth for at least the next several years.
- The University of Hawai'i at Hilo is scheduled to open a new undergraduate housing complex in Fall 2013. This complex will add 300 housing units to the current inventory, bringing the total to around 900. This complex is Phase 1 in the University Village development plan, that includes a commercial center, with the goal of creating a college town environment. New housing, along with continued mild growth in graduate level programs, will help to boost enrollment over 4,350 by Fall 2018.
- Classified graduate enrollment at UH Mānoa declined 1.3% in Fall 2011 and another 5.1% in Fall 2012. Further mild decline is anticipated. The decline in graduate enrollment may be offset by increases in undergraduate transfers from the UH Community Colleges, as well as some growth in continuing student enrollment. Overall, enrollment at UH Mānoa is forecast to increase very mildly through Fall 2018.
- Enrollment at the UH Community Colleges grew rapidly from Fall 2006 to 2009, increasing by over 27% in just three years. However, enrollment growth slowed in Fall 2010 and has declined the last two years. One factor for the decrease is the improving labor market (declining unemployment rates), which our model shows has a negative impact on enrollment. The improving labor market may allow more students to opt for work rather than continued post-secondary education. The forecast calls for stability in enrollment for the UHCC system as a whole, with the total remaining above 33,000 through Fall 2018.

## **SUMMARY AND CONCLUSION**

Enrollment for the UH system grew slowly but steadily from the founding of the UH Mānoa campus in 1907 through 1960, when total UH system enrollment measured 7,771 (Figure 4). After that initial period of steady growth, the UH system saw periods of rapid growth through the 1960s and into the early 1970s, from Fall 2000 to Fall 2004, and most recently from Fall 2006 to Fall 2011. During this most recent period of growth, system level enrollment increased by more than 10,300 students (21%), setting a new all-time high of 60,330 in Fall 2011. The decline in enrollment measured in Fall 2012 is the first decrease since Fall 2006.

Despite the decrease in Fall 2012, enrollment for the UH system remains at a very high level historically. Enrollment is forecast to increase further, but at a slower rate and more unevenly across the campuses. Much of the recent growth occurred at the UH Community Colleges. For the next several years, growth will be led by the UH four-year campuses, especially UH West O‘ahu. Furthermore, although mild increase is projected, the current environment includes a stronger possibility of enrollment decline than in the recent past.

Figure 1  
Historical and Projected Headcount Enrollment

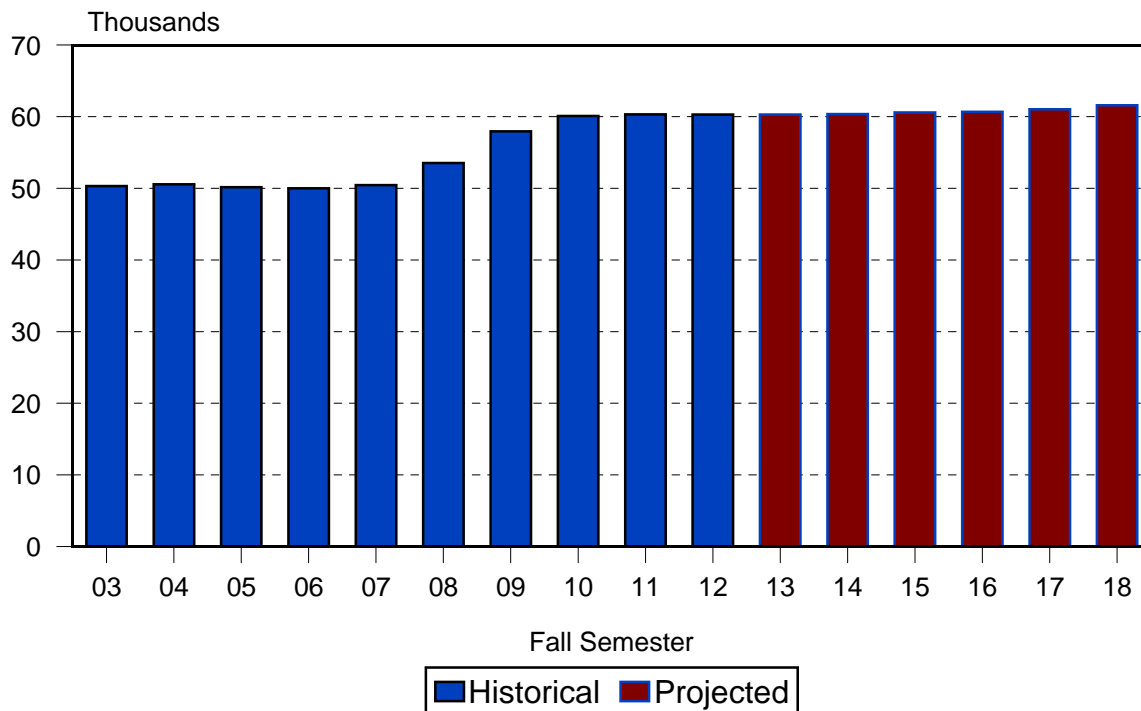


Figure 2  
Headcount Enrollment Index - UH System

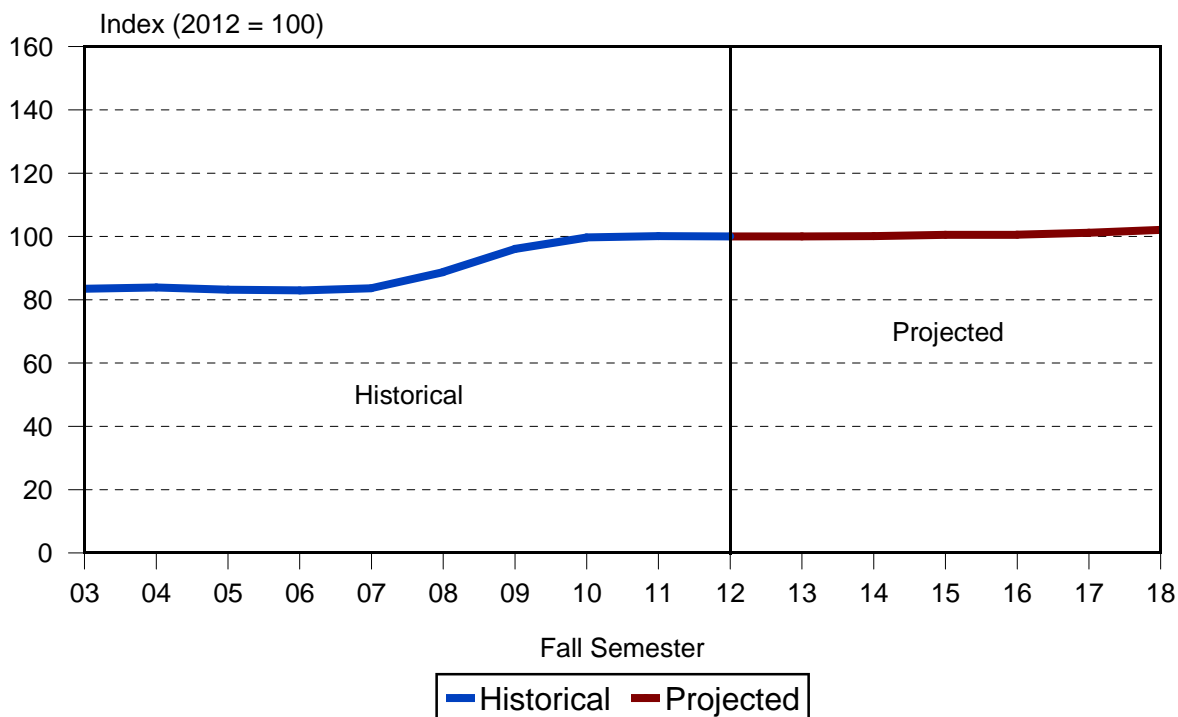




Figure 3  
Projected Enrollment with Error Boundaries

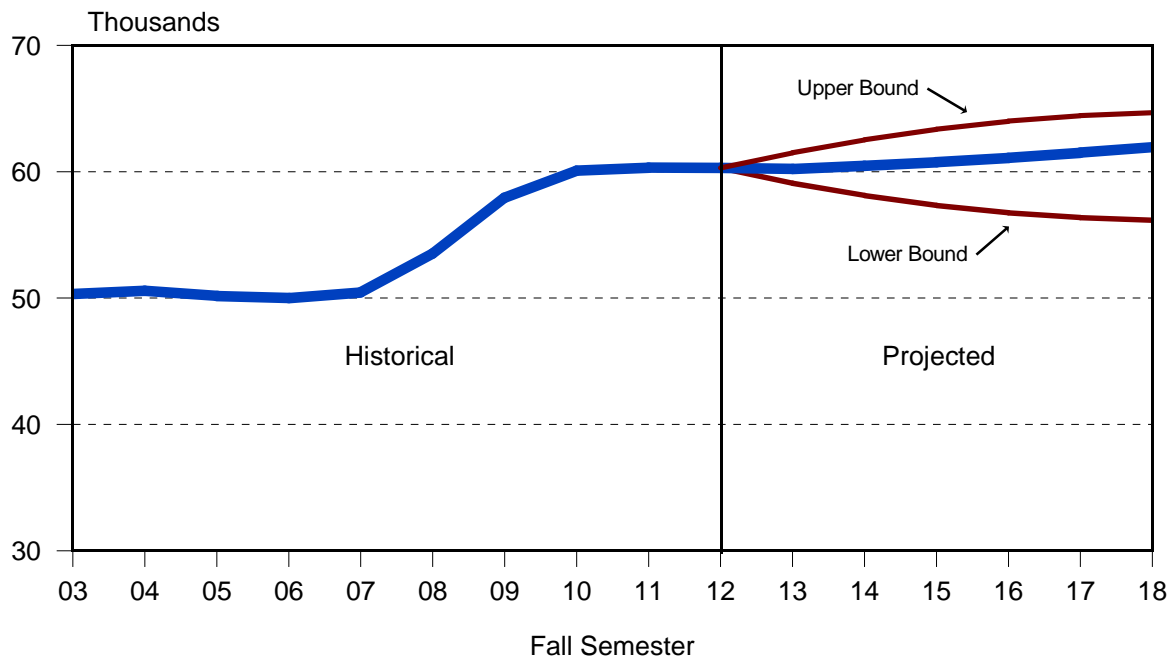


Figure 4  
Historical and Projected Enrollment - UH System

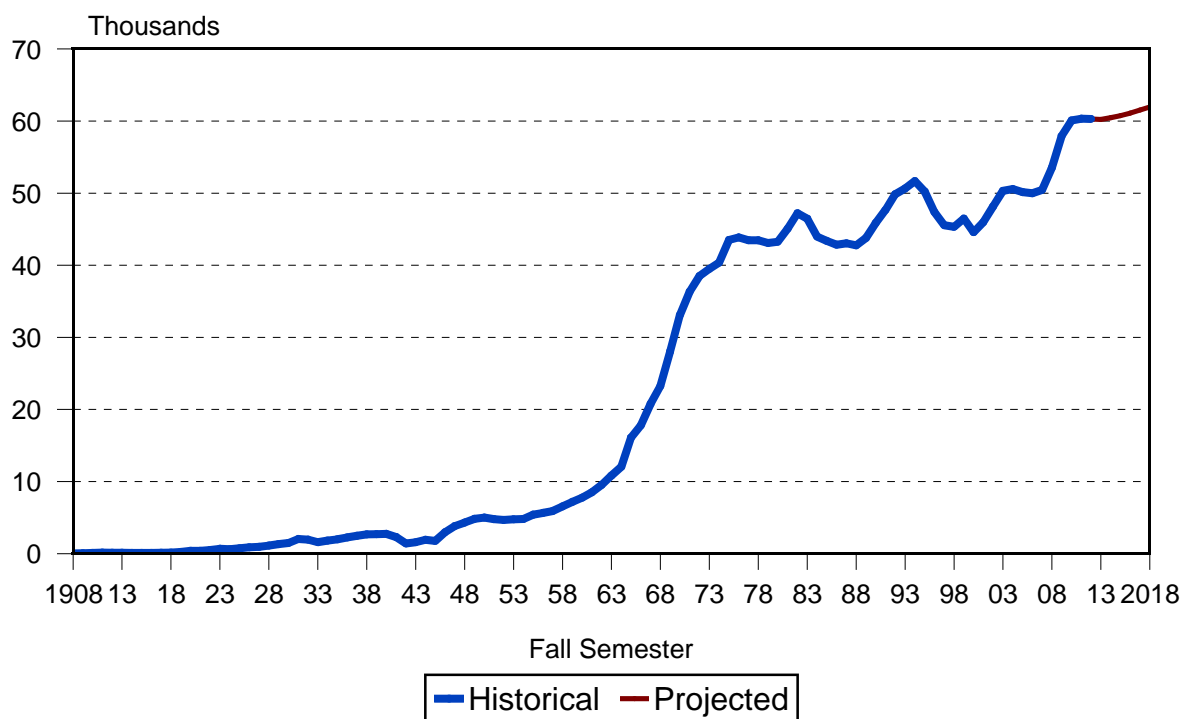


Figure 5  
Headcount Enrollment Index - UH Mānoa

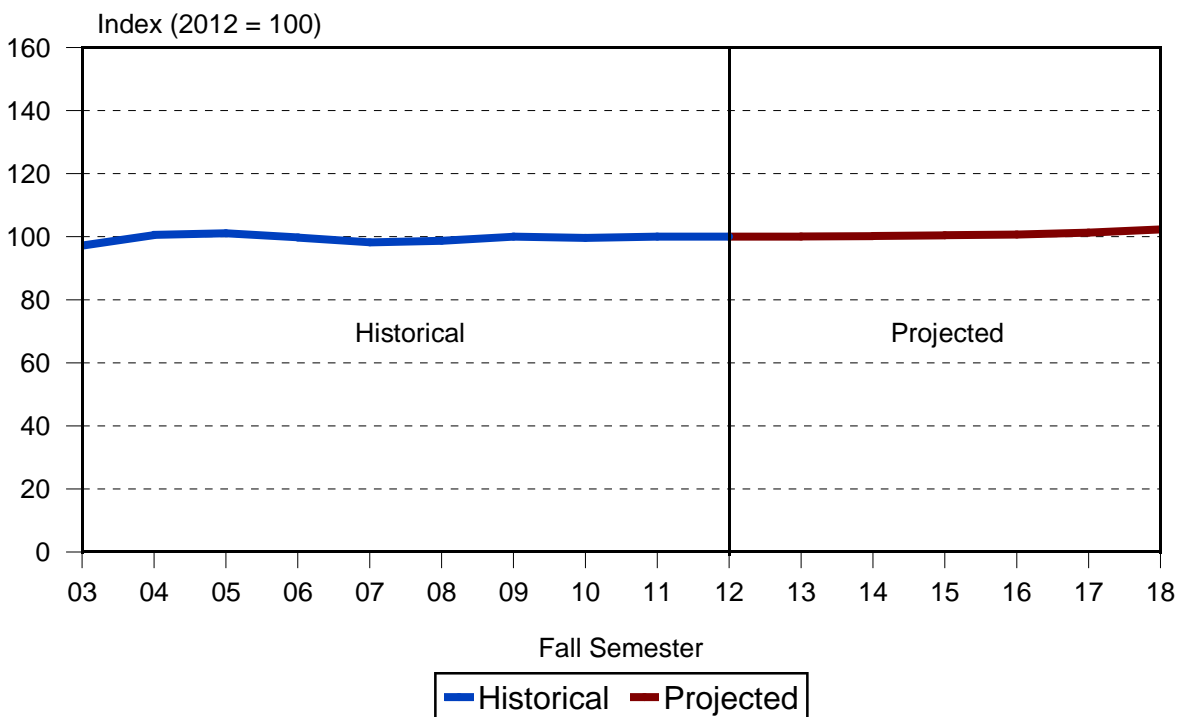


Figure 6  
Headcount Enrollment Index - UH Hilo

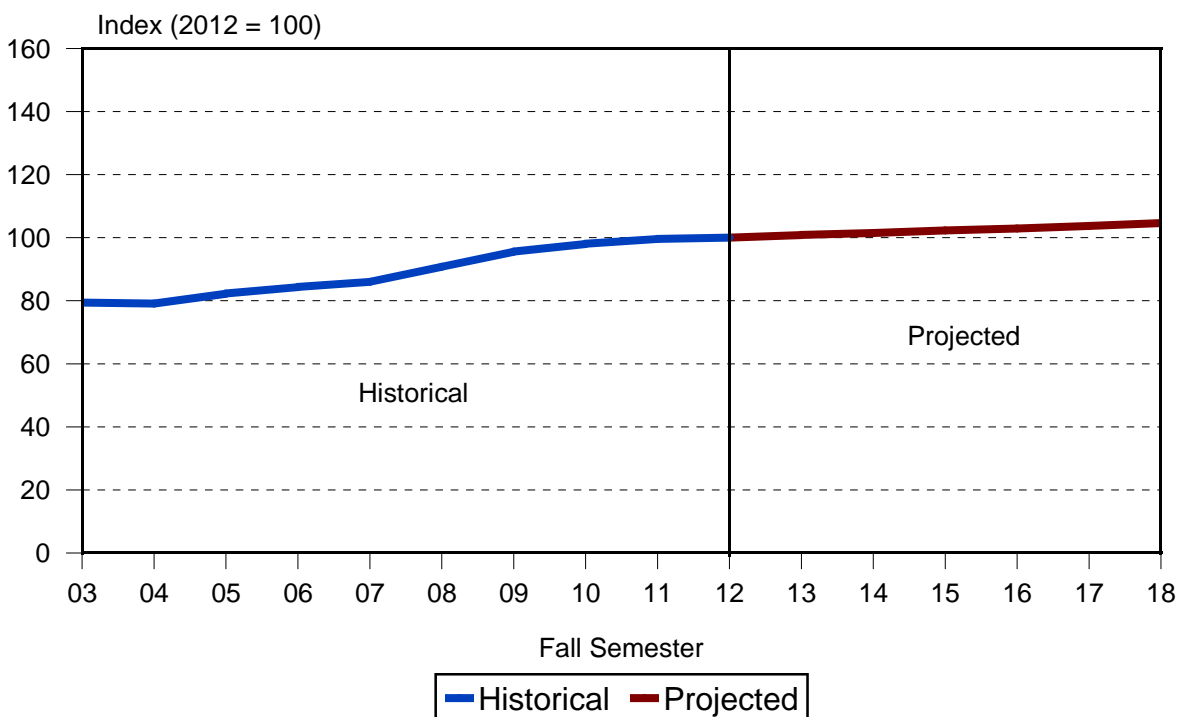


Figure 7  
Headcount Enrollment Index - UH-West O'ahu

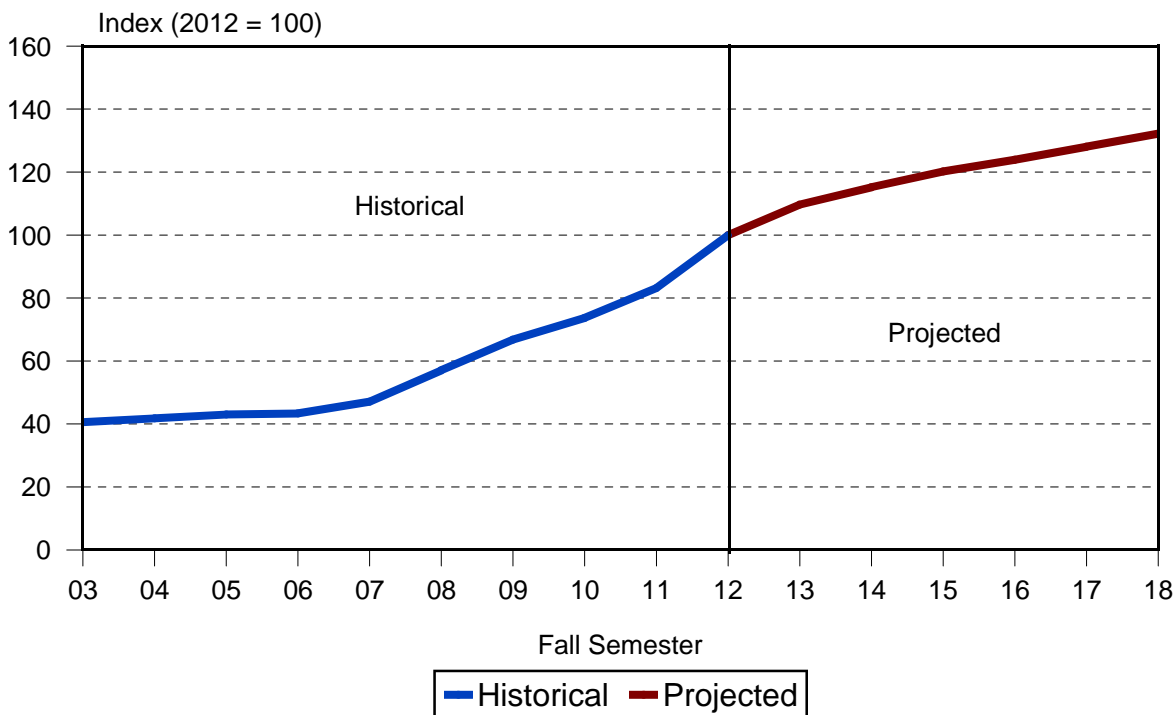


Figure 8  
Headcount Enrollment Index - UH Community Colleges

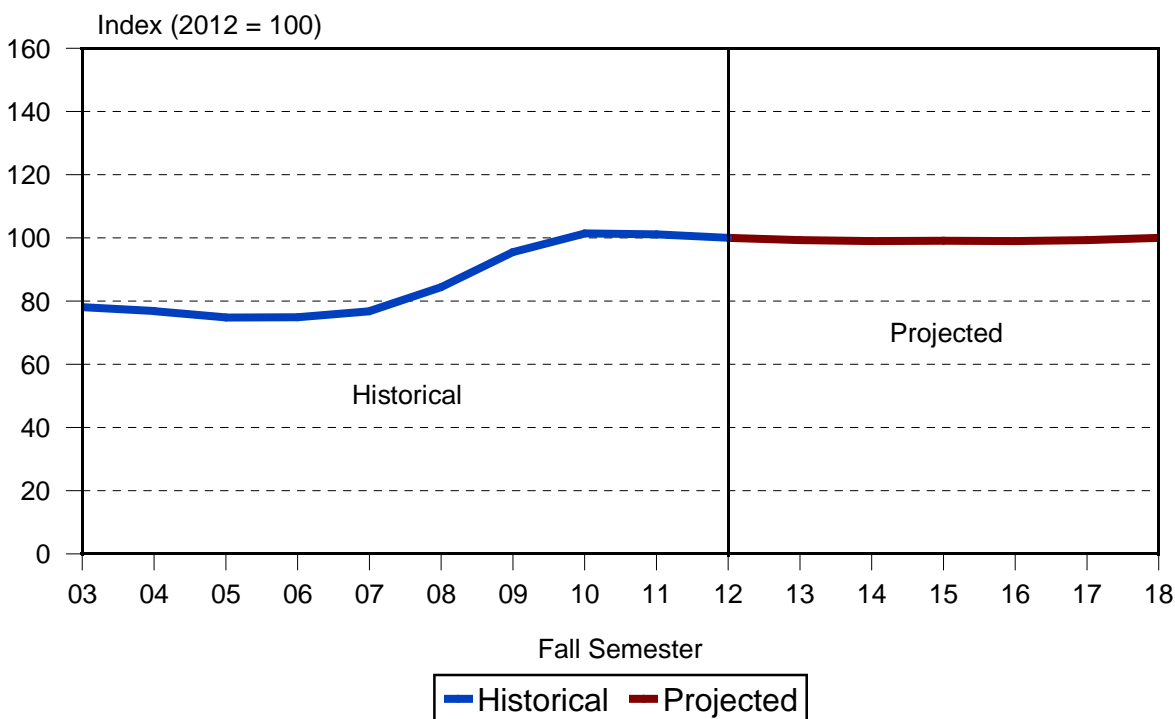


TABLE 1  
HEADCOUNT ENROLLMENT OF CREDIT STUDENTS BY CAMPUS  
UNIVERSITY OF HAWAI'I  
FALL 2007 TO FALL 2018

CAMPUS	HISTORICAL						PROJECTED					
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
UH SYSTEM TOTAL .....	50,454	53,526	57,945	60,090	60,330	60,295	60,292	60,357	60,593	60,679	61,028	61,588
UH AT MĀNOA .....	20,051	20,169	20,435	20,337	20,429	20,426	20,437	20,472	20,522	20,562	20,691	20,888
UH AT HILO .....	3,573	3,773	3,974	4,079	4,139	4,157	4,195	4,221	4,254	4,277	4,312	4,352
UH - WEST O'AHU .....	940	1,140	1,333	1,471	1,662	1,997	2,190	2,301	2,400	2,475	2,559	2,643
UH COMMUNITY COLLEGES ....	25,890	28,444	32,203	34,203	34,100	33,715	33,470	33,363	33,417	33,365	33,466	33,705
Hawai'i Community College .....	2,603	2,884	3,275	3,815	3,917	3,663	3,573	3,539	3,533	3,518	3,522	3,526
Honolulu Community College ....	4,027	4,218	4,567	4,725	4,600	4,582	4,571	4,569	4,575	4,565	4,564	4,587
Kapi'olani Community College ..	7,517	8,221	9,102	9,301	9,023	8,892	8,806	8,759	8,738	8,693	8,685	8,741
Kaua'i Community College .....	1,051	1,104	1,345	1,428	1,433	1,495	1,520	1,535	1,548	1,566	1,578	1,585
Leeward Community College ....	5,887	6,771	7,484	7,942	7,895	7,960	7,918	7,905	7,917	7,909	7,949	8,017
UH Maui College .....	2,981	3,287	4,114	4,367	4,527	4,382	4,336	4,306	4,340	4,350	4,399	4,461
Windward Community College ..	1,824	1,959	2,316	2,625	2,705	2,741	2,746	2,750	2,766	2,764	2,769	2,788

Note: Headcounts include specials (early admits and concurrent students) for all years.

Source: UH Institutional Research and Analysis Office; July 2013.

TABLE 2  
HEADCOUNT ENROLLMENT OF CREDIT STUDENTS BY REGISTRATION STATUS  
UNIVERSITY OF HAWAI'I  
FALL 2007 TO FALL 2018

EDUCATION LEVEL AND REGISTRATION STATUS	HISTORICAL						PROJECTED					
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
UH SYSTEM TOTAL .....	50,454	53,526	57,945	60,090	60,330	60,295	60,292	60,357	60,593	60,679	61,028	61,588
Classified .....	42,431	44,910	48,531	50,717	51,172	51,477	51,609	51,740	51,980	52,076	52,393	52,897
Undergraduates .....	36,838	38,988	42,322	44,409	44,943	45,544	45,766	45,957	46,244	46,364	46,673	47,142
First-Time Students 1/ .....	7,125	8,136	8,563	8,737	8,579	8,580	8,559	8,534	8,633	8,528	8,711	8,932
Transfer .....	4,555	4,976	5,738	5,605	5,741	6,105	6,117	6,203	6,289	6,372	6,457	6,534
Returning .....	2,172	2,211	2,529	2,203	2,296	2,342	2,342	2,344	2,346	2,346	2,348	2,350
Continuing .....	22,986	23,665	25,492	27,864	28,327	28,517	28,748	28,876	28,976	29,118	29,157	29,326
Graduates .....	5,593	5,922	6,209	6,308	6,229	5,933	5,843	5,783	5,736	5,712	5,720	5,755
Unclassified & No Data .....	8,023	8,616	9,414	9,373	9,158	8,818	8,683	8,617	8,613	8,603	8,635	8,691
Undergraduates 2/ .....	3,111	3,082	3,032	2,674	2,564	2,428	2,402	2,391	2,402	2,395	2,407	2,426
Graduates .....	939	856	804	734	582	547	530	518	511	509	512	520
Home-Based at Other UH 3/ .	3,973	4,678	5,578	5,965	6,012	5,843	5,751	5,708	5,700	5,699	5,716	5,745

Note: Headcounts include specials (early admits and concurrent students) for all years; include continuing education credit enrollments, beginning Fall 1999.

1/ Includes first-time freshmen at UH Manoa and UH Hilo, Includes all first-time classified students at the UH Community Colleges.

2/ Includes records with invalid data on education level.

3/ Students whose home-campus, as defined in Banner / ODS, is not the campus at which they are registered for classes.

TABLE 3  
HEADCOUNT ENROLLMENT OF CREDIT STUDENTS BY CAMPUS  
ANNUAL PERCENTAGE CHANGE  
UNIVERSITY OF HAWAI'I  
FALL 2007 TO FALL 2018

CAMPUS	HISTORICAL						PROJECTED					
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
UH SYSTEM TOTAL .....	0.9	6.1	8.3	3.7	0.4	-0.1	-0.1	0.1	0.4	0.1	0.6	0.9
UH AT MĀNOA .....	-1.5	0.6	1.3	-0.5	0.5	0.0	0.0	0.2	0.2	0.2	0.6	1.0
UH AT HILO .....	1.9	5.6	5.3	2.6	1.5	0.4	1.4	0.6	0.8	0.5	0.8	0.9
UH - WEST O'AHU .....	8.5	21.3	16.9	10.4	13.0	20.2	31.8	5.1	4.3	3.1	3.4	3.3
UH COMMUNITY COLLEGES .....	2.5	9.9	13.2	6.2	-0.3	-1.1	-1.8	-0.3	0.2	-0.2	0.3	0.7
Hawai'i Community College .....	10.4	10.8	13.6	16.5	2.7	-6.5	-8.8	-1.0	-0.2	-0.4	0.1	0.1
Honolulu Community College .....	-2.8	4.7	8.3	3.5	-2.6	-0.4	-0.6	0.0	0.1	-0.2	0.0	0.5
Kapi'olani Community College ....	3.4	9.4	10.7	2.2	-3.0	-1.5	-2.4	-0.5	-0.2	-0.5	-0.1	0.6
Kaua'i Community College .....	-6.1	5.0	21.8	6.2	0.4	4.3	6.1	1.0	0.8	1.2	0.8	0.4
Leeward Community College .....	2.5	15.0	10.5	6.1	-0.6	0.8	0.3	-0.2	0.2	-0.1	0.5	0.9
UH Maui College .....	4.9	10.3	25.2	6.1	3.7	-3.2	-4.2	-0.7	0.8	0.2	1.1	1.4
Windward Community College ....	2.4	7.4	18.2	13.3	3.0	1.3	1.5	0.1	0.6	-0.1	0.2	0.7

TABLE 4  
HEADCOUNT ENROLLMENT OF CREDIT STUDENTS BY CAMPUS  
ENROLLMENT INDEX  
UNIVERSITY OF HAWAI'I  
FALL 2007 TO FALL 2018

CAMPUS	HISTORICAL						PROJECTED					
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
UH SYSTEM TOTAL .....	84	89	96	100	100	100	100	100	100	101	101	102
UH AT MĀNOA .....	98	99	100	100	100	100	100	100	100	101	101	102
UH AT HILO .....	86	91	96	98	100	100	101	102	102	103	104	105
UH - WEST O'AHU .....	47	57	67	74	83	100	110	115	120	124	128	132
UH COMMUNITY COLLEGES .....	77	84	96	101	101	100	99	99	99	99	99	100
Hawai'i Community College .....	71	79	89	104	107	100	98	97	96	96	96	96
Honolulu Community College .....	88	92	100	103	100	100	100	100	100	100	100	100
Kapi'olani Community College .....	85	92	102	105	101	100	99	99	98	98	98	98
Kaua'i Community College .....	70	74	90	96	96	100	102	103	104	105	106	106
Leeward Community College .....	74	85	94	100	99	100	99	99	99	99	100	101
UH Maui College .....	68	75	94	100	103	100	99	98	99	99	100	102
Windward Community College .....	67	71	84	96	99	100	100	100	101	101	101	102

Note: Fall 2012 = 100.

TABLE 5  
STUDENT SEMESTER HOURS OFFERED BY CAMPUS  
UNIVERSITY OF HAWAI'I  
FALL 2012 TO FALL 2018

	ACTUAL	PROJECTED					
	2012	2013	2014	2015	2016	2017	2018
UH SYSTEM TOTAL .....	600,890	602,345	603,794	606,623	607,828	611,594	617,473
UH AT MĀNOA .....	239,675	240,613	241,466	242,428	243,104	244,760	247,208
UH AT HILO .....	52,834	53,258	53,562	53,956	54,234	54,662	55,160
UH - WEST O'AHU .....	18,332	20,161	21,198	22,129	22,815	23,617	24,425
UH COMMUNITY COLLEGES .....	290,049	288,313	287,568	288,110	287,675	288,555	290,680
Hawai'i Community College .....	34,317	33,500	33,173	33,116	32,969	33,008	33,042
Honolulu Community College .....	39,187	39,116	39,106	39,145	39,048	39,039	39,247
Kapi'olani Community College .....	74,228	73,608	73,263	73,119	72,734	72,671	73,184
Kaua'i Community College .....	12,975	13,252	13,409	13,534	13,696	13,809	13,868
Leeward Community College .....	68,784	68,790	68,853	69,039	68,999	69,346	69,947
UH Maui College .....	38,512	38,019	37,734	38,007	38,103	38,521	39,074
Windward Community College .....	22,047	22,028	22,030	22,150	22,126	22,161	22,318



TABLE 6  
FULL-TIME EQUIVALENT COURSE ENROLLMENT SERVED BY CAMPUS  
UNIVERSITY OF HAWAI'I  
FALL 2012 TO FALL 2018

	ACTUAL	PROJECTED					
	2012	2013	2014	2015	2016	2017	2018
UH SYSTEM TOTAL .....	40,907	41,002	41,092	41,265	41,343	41,597	41,997
UH AT MĀNOA .....	16,704	16,754	16,805	16,857	16,901	17,012	17,184
UH AT HILO .....	3,644	3,680	3,701	3,727	3,746	3,774	3,809
UH - WEST O'AHU .....	1,221	1,345	1,414	1,476	1,521	1,575	1,628
UH COMMUNITY COLLEGES .....	19,338	19,223	19,172	19,205	19,175	19,236	19,376
Hawai'i Community College .....	2,288	2,234	2,211	2,209	2,197	2,200	2,201
Honolulu Community College .....	2,610	2,608	2,607	2,609	2,602	2,602	2,617
Kapi'olani Community College .....	4,950	4,908	4,884	4,874	4,848	4,844	4,879
Kaua'i Community College .....	865	884	893	902	913	920	925
Leeward Community College .....	4,586	4,586	4,591	4,602	4,600	4,624	4,662
UH Maui College .....	2,571	2,534	2,517	2,534	2,541	2,569	2,604
Windward Community College ....	1,468	1,469	1,469	1,475	1,474	1,477	1,488

TABLE 7  
HEADCOUNT ENROLLMENT OF CREDIT STUDENTS BY ATTENDANCE STATUS  
UNIVERSITY OF HAWAI'I  
FALL 2012 TO FALL 2018

	ACTUAL	PROJECTED					
	2012	2013	2014	2015	2016	2017	2018
UH SYSTEM TOTAL 1/ .....	60,295	60,292	60,357	60,593	60,679	61,028	61,588
Full-Time .....	31,870	31,816	31,869	31,994	32,052	32,252	32,552
Part-Time .....	28,425	28,476	28,488	28,599	28,627	28,776	29,036
UH AT MĀNOA .....	20,426	20,437	20,472	20,522	20,562	20,691	20,888
Full-Time .....	14,927	14,936	14,961	14,997	15,026	15,121	15,264
Part-Time .....	5,499	5,501	5,511	5,525	5,536	5,570	5,624
UH AT HILO .....	4,157	4,195	4,221	4,254	4,277	4,312	4,352
Full-Time .....	3,273	3,315	3,335	3,361	3,379	3,407	3,439
Part-Time .....	884	880	886	893	898	905	913
UH - WEST O'AHU .....	1,997	2,190	2,301	2,400	2,475	2,559	2,643
Full-Time .....	830	915	964	1,006	1,037	1,073	1,111
Part-Time .....	1,167	1,275	1,337	1,394	1,438	1,486	1,532
UH COMMUNITY COLLEGES .....	33,715	33,470	33,363	33,417	33,365	33,466	33,705
Full-Time .....	12,840	12,650	12,609	12,630	12,610	12,651	12,738
Part-Time .....	20,875	20,820	20,754	20,787	20,755	20,815	20,967
Hawai'i Community College .....	3,663	3,573	3,539	3,533	3,518	3,522	3,526
Full-Time .....	1,695	1,675	1,660	1,657	1,650	1,652	1,653
Part-Time .....	1,968	1,898	1,879	1,876	1,868	1,870	1,873
Honolulu Community College .....	4,582	4,571	4,569	4,575	4,565	4,564	4,587
Full-Time .....	1,633	1,650	1,650	1,652	1,648	1,648	1,656
Part-Time .....	2,949	2,921	2,919	2,923	2,917	2,916	2,931

TABLE 7  
HEADCOUNT ENROLLMENT OF CREDIT STUDENTS BY ATTENDANCE STATUS  
UNIVERSITY OF HAWAI'I  
FALL 2012 TO FALL 2018

	ACTUAL	PROJECTED					
	2012	2013	2014	2015	2016	2017	2018
Kapi'olani Community College .....	8,892	8,806	8,759	8,738	8,693	8,685	8,741
Full-Time .....	3,150	3,001	2,985	2,978	2,962	2,960	2,979
Part-Time .....	5,742	5,805	5,774	5,760	5,731	5,725	5,762
Kaua'i Community College .....	1,495	1,520	1,535	1,548	1,566	1,578	1,585
Full-Time .....	571	591	597	602	609	614	617
Part-Time .....	924	929	938	946	957	964	968
Leeward Community College .....	7,960	7,918	7,905	7,917	7,909	7,949	8,017
Full-Time .....	3,233	3,188	3,182	3,187	3,184	3,200	3,227
Part-Time .....	4,727	4,730	4,723	4,730	4,725	4,749	4,790
UH Maui College .....	4,382	4,336	4,306	4,340	4,350	4,399	4,461
Full-Time .....	1,644	1,618	1,607	1,620	1,624	1,642	1,665
Part-Time .....	2,738	2,718	2,699	2,720	2,726	2,757	2,796
Windward Community College ....	2,741	2,746	2,750	2,766	2,764	2,769	2,788
Full-Time .....	914	927	928	934	933	935	941
Part-Time .....	1,827	1,819	1,822	1,832	1,831	1,834	1,847

1/ Headcounts include specials (early admits and concurrent students) for all years.

Note: records with invalid data on attendance status are included with part-time.

**APPENDIX A**  
**HAWAI'I PUBLIC HIGH SCHOOL SENIORS BY SCHOOL DISTRICT**  
**ACADEMIC YEARS 2007-08 TO 2018-19**

SCHOOL DISTRICT	HISTORICAL						PROJECTED					
	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
TOTAL .....	9,819	9,990	9,400	9,602	9,897	9,588	9,408	9,566	9,111	9,271	9,630	9,226
O'ahu Districts .....	6,370	6,370	6,032	6,232	6,568	6,224	6,097	6,107	5,787	5,869	6,205	5,882
Honolulu District .....	1,664	1,726	1,566	1,668	1,710	1,666	1,654	1,627	1,505	1,484	1,636	1,530
Central District .....	1,699	1,753	1,697	1,784	1,964	1,803	1,800	1,822	1,724	1,747	1,811	1,719
Leeward District .....	2,157	2,091	2,039	2,002	2,075	2,044	1,963	1,957	1,922	2,019	2,097	2,011
Windward District .....	850	800	730	778	819	711	680	701	636	619	661	622
Neighbor Island Districts ....	3,225	3,372	3,134	3,133	3,065	3,102	2,962	3,000	2,845	2,898	2,911	2,805
Hawai'i District .....	1,474	1,565	1,520	1,382	1,384	1,348	1,327	1,314	1,245	1,264	1,268	1,270
Maui District .....	1,159	1,179	1,091	1,156	1,087	1,182	1,089	1,154	1,052	1,104	1,132	1,032
Kaua'i District .....	592	628	523	595	594	572	546	532	548	530	511	503
Other Schools .....	224	248	234	237	264	262	349	459	479	504	514	539
Charter Schools 1/ .....	224	248	234	237	264	262	349	459	479	504	514	539

1/ Includes all districts.

Source: Department of Education for the State of Hawai'i. Regular Education seniors only.

APPENDIX B  
HAWAI'I HIGH SCHOOL GRADUATES  
WICHE HISTORICAL AND PROJECTED - 2012 SERIES

Academic Year	Total	Pct Chnge	Public	Pct Chnge	Private	Pct Chnge
1996-97	11,547		8,929		2,618	
1997-98	12,246	6.1	9,670	8.3	2,576	-1.6
1998-99	12,247	0.0	9,714	0.5	2,533	-1.7
1999-00	13,398	9.4	10,437	7.4	2,961	16.9
2000-01	13,490	0.7	10,102	-3.2	3,388	14.4
2001-02	13,536	0.3	10,452	3.5	3,084	-9.0
2002-03	12,793	-5.5	10,013	-4.2	2,780	-9.9
2003-04	12,953	1.3	10,324	3.1	2,629	-5.4
2004-05	13,396	3.4	10,813	4.7	2,583	-1.7
2005-06	13,080	-2.4	10,922	1.0	2,158	-16.5
2006-07	13,448	2.8	11,063	1.3	2,385	10.5
2007-08	14,137	5.1	11,613	5.0	2,524	5.8
2008-09	14,167	0.2	11,508	-0.9	2,659	5.3
2009-10	13,535	-4.5	10,807	-6.1	2,728	2.6
2010-11	13,745	1.6	11,037	2.1	2,708	-0.7
2011-12	13,738	-0.1	10,990	-0.4	2,748	1.5
2012-13	13,502	-1.7	10,647	-3.1	2,855	3.9
2013-14	13,125	-2.8	10,347	-2.8	2,778	-2.7
2014-15	12,852	-2.1	10,168	-1.7	2,684	-3.4
2015-16	12,997	1.1	10,259	0.9	2,738	2.0
2016-17	13,252	2.0	10,278	0.2	2,974	8.6
2017-18	13,654	3.0	10,628	3.4	3,026	1.7
2018-19	12,895	-5.6	10,020	-5.7	2,875	-5.0
2019-20	13,354	3.6	10,532	5.1	2,822	-1.8
2020-01	13,772	3.1	10,738	2.0	3,034	7.5
2021-22	13,910	1.0	10,823	0.8	3,087	1.7
2022-23	13,681	-1.6	10,666	-1.5	3,015	-2.3
2023-24	14,456	5.7	11,281	5.8	3,175	5.3
2024-25	14,581	0.9	11,388	0.9	3,193	0.6
2025-26	14,844	1.8	11,579	1.7	3,265	2.3
2026-27	14,391	-3.1	11,223	-3.1	3,168	-3.0
2027-28	14,470	0.5	11,288	0.6	3,182	0.4

Note: Horizontal line delimits actual from projected numbers.

Note: WICHE "Historical" data may differ from UH IRO compiled data shown in the MAPS reports on the High School Background of First-Time Students.

SOURCE: "Knocking at the Door, Projections of High School Graduates," December 2012; WICHE.

# **Appendix C**

## **University of Hawai'i Enrollment Projection Model, 2013**

### **Introduction**

Student enrollment directly influences the University budget, program planning and decision making, as well as the human capital development and labor market for the State of Hawai'i. A set of transfer function models, which incorporate both longitudinal change over time and cross-sectional economic and demographic factors, has been created to project student enrollment at the University of Hawai'i units: UH Mānoa, UH Hilo, UH West Oahu and the UH Community Colleges.

### **Major Factors Affecting Student Enrollment**

The following economic and demographic variables were included in the initial specifications for each model.

Dependent variable:

- Enrollment headcount (1977-2012), with associated time lags.

Independent variables (economic and demographic factors):

- Number of Hawaii high school graduates, one-year time lag;
- Hawai'i unemployment rate, one-year time lag;
- Hawai'i real gross national product, one-year time lag (in millions of 2005 dollars);
- Hawai'i real per capita personal income, one-year time lag (in 2005 dollars);
- Hawai'i Consumer Price Index (CPI-U), one-year time lag (in 2005 dollars).

### **Data Sources:**

- University of Hawai'i ODS (Operational Data Store) student data warehouse;
- University of Hawai'i Institutional Research and Analysis Office: Enrollment Projections, University of Hawai'i, Fall 2012 to Fall 2017;
- U.S. Bureau of Economic Analysis (BEA);
- U.S. Bureau of Labor Statistics (BLS);
- Hawai'i State Department of Labor, Monthly Local Area Unemployment Statistics (LAUS);
- Hawai'i State Department of Business, Economic Development and Tourism (DBEDT): Hawai'i Databook & Quarterly Statistical & Economic Report (QSER);
- Hawai'i State Department of Education, Hawai'i Public School Official Enrollment Count.
- Western Interstate Commission for Higher Education, Hawai'i Public and Private High School Graduates.

## Transfer Function (Multivariate ARIMA) Model and Projection for the University of Hawai'i System

After several rounds of goodness-of-fit selection, we identified an ARIMA (1,0,0) model for UH System student enrollment, with independent variables being real gross national product, unemployment rate and high school graduates. The estimated model coefficients were all statistically significant at the  $p < 0.001$  level.

Model Description			
			Model Type
Model ID	UHENroll	Model_1	ARIMA(1,0,0)

ARIMA Model Parameters							
					Estimate	SE	t
					Sig.		
UHENroll-Model_1	UHENroll	No Transformation	AR	Lag 1	.932	.061	15.190
	GDP	No Transformation	Numerator	Lag 0	.468	.091	5.146
	Unemrate	No Transformation	Numerator	Lag 0	1791618	333.211	5.377
	Hsgrad	No Transformation	Numerator	Lag 0	1.461	.357	4.091

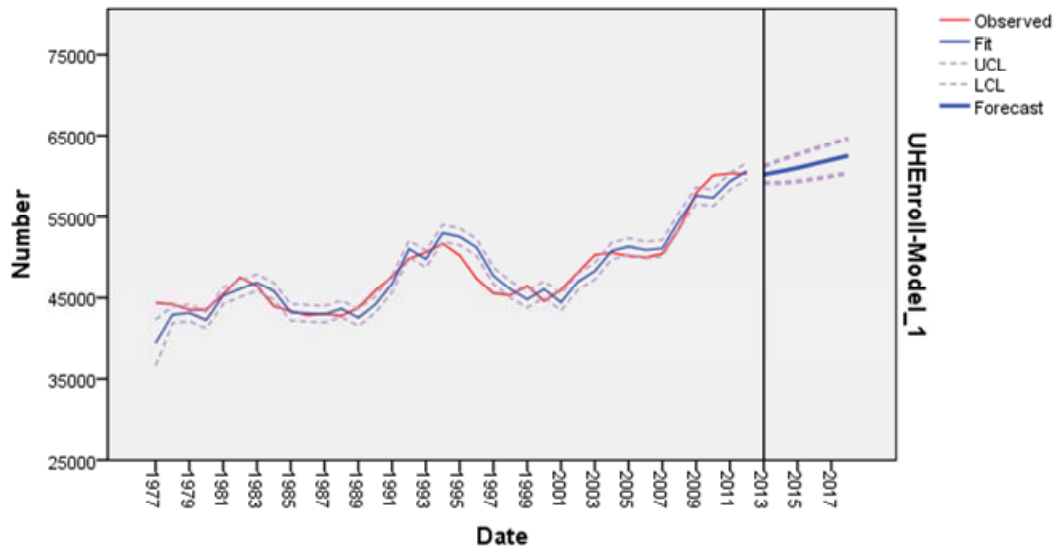
Model Fit statistics							
Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Normalized BIC
.893	.893	1711.061	2.648	1265.093	11.071	4911.763	15.288

The definition and selection criteria for the tables shown above, model goodness-of-fit measures, are listed in the Appendix. They include: stationary r-square, r-square, root mean square error, mean absolute percentage error, mean absolute error, maximum absolute percentage error, maximum absolute error, and normalized BIC (Bayesian Information Criterion).

### Model Findings:

- The University of Hawai'i student enrollment was strongly correlated with Hawai'i real gross national product, unemployment rate, number of high school graduates and prior year student enrollment.
- Hawai'i real gross national product showed a strong and positive effect on student enrollment. After controlling for other factors, an increase of \$1 million in Hawai'i real gross national product contributes a 0.47 unit increase in student enrollment.
- The model showed that the higher the unemployment rate, the more likely that students would enroll in college. Conversely, an improving labor market (lower unemployment rate) may allow more students to opt for work, resulting in lower the post-secondary enrollment.
- The model also showed that the higher the number of high school graduates, the higher the post-secondary enrollment. Conversely, declining numbers of high school graduates can lower the enrollment.
- The prior year student enrollment also had a strong and positive effect on the current year student enrollment.
- After a period of rapid growth from 2000 to 2010, the enrollment numbers have been stable at around 60,000 for the last three years. The model predicts that University of Hawai'i student enrollment will be growing at a relatively slow pace over the next five years.

The following chart and table show the enrollment forecast and corresponding 95% upper and lower critical level intervals.



### Transfer Function (Multivariate ARIMA) Model and Projection for the UH Community Colleges

After several rounds of goodness-of-fit selection, we identified an ARIMA (1,0,0) model for the UH Community College student enrollment, with independent variables of real gross national product, unemployment rate and high school graduates. The estimated model coefficients were all statistically significant at the  $p < 0.001$  level.

Model Description			
			Model Type
Model ID	CC	Model_1	ARIMA(1,0,0)

ARIMA Model Parameters					Estimate	SE	t	Sig.
CC-Model_1	CC	No Transformation	AR	Lag 1	.858	.088	9.762	.000
	GDP	No Transformation	Numerator	Lag 0	.262	.042	6.273	.000
	Unemrate	No Transformation	Numerator	Lag 0	1251.099	200.691	6.234	.000
	Hsgrad	No Transformation	Numerator	Lag 0	.649	.169	3.841	.001

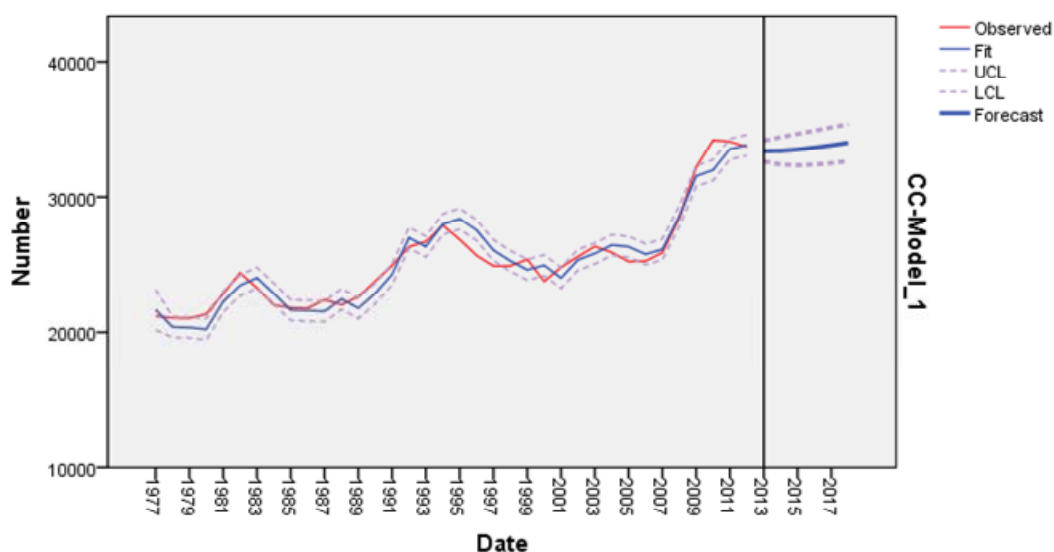
Model Fit statistics							
Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Normalized BIC
.942	.942	902.491	2.847	713.066	7.288	2211.636	14.008

### Model Findings:

- University of Hawai'i Community College student enrollment was strongly correlated with Hawai'i real gross national product, unemployment rate, number of high school graduates and the prior year UHCC student enrollment.



- Hawai'i real gross national product showed a strong and positive effect on student enrollment. After controlling for other factors, an increase of \$1 million in Hawai'i real gross national product contributes a 0.26 unit increase in UH Community College enrollment.
- The model showed that the higher the unemployment rate, the more likely students would enroll at a UH Community College. Conversely, an improving labor market (lower unemployment rate) may allow more students to opt for work and lower the enrollment.
- The model also showed that the higher the number of high school graduates, the higher would be the UH Community College student enrollment. Conversely, declining numbers of high school graduates can lower the enrollment.
- The prior year student enrollment also had a strong and positive effect on the current year student enrollment.
- The model predicts that University of Hawai'i Community College student enrollment will be growing at a relatively stable and slow pace. The following chart and table show the enrollment forecasts and the corresponding 95% upper and lower critical level intervals.



### Transfer Function (Multivariate ARIMA) Model and Projection for the UH Four-Year Colleges

We identified an ARIMA (1,0,0) model with independent variables of Hawai'i real per capita personal income, unemployment rate and number of high school graduates for the University of Hawai'i four-year campuses taken as a whole. The estimated model coefficients were all statistically significant at  $p < 0.005$  level. The model estimates and projection charts are listed below.

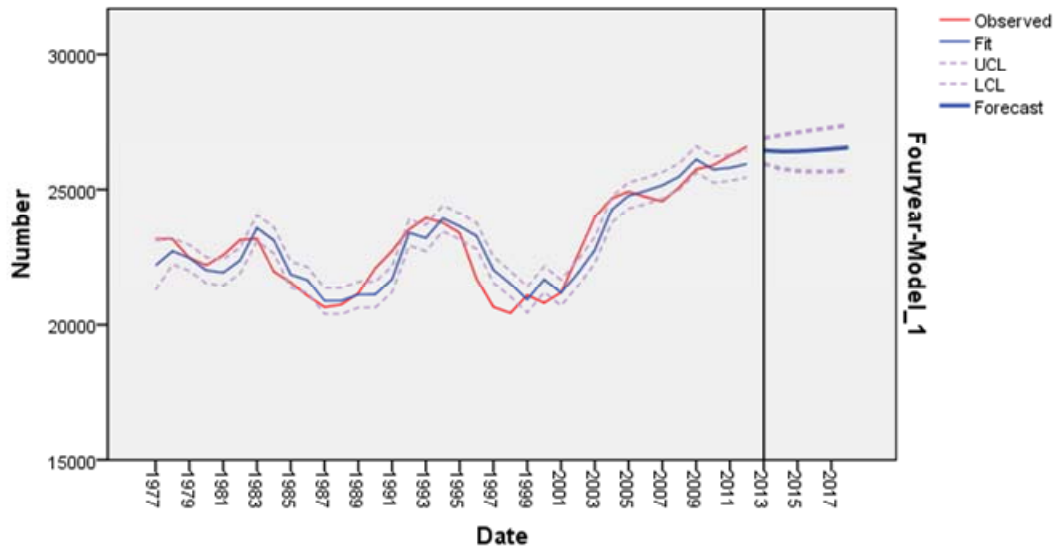
Model Description			
			Model Type
Model ID	Fouryear	Model_1	ARIMA(1,0,0)

ARIMA Model Parameters								
					Estimate	SE	t	Sig.
Fouryear-Model_1	Fouryear	No Transformation	AR	Lag 1	.849	.094	9.018	.000
	PI	No Transformation	Numerator	Lag 0	.561	.100	5.588	.000
	Unemrate	No Transformation	Numerator	Lag 0	519.092	159.813	3.248	.003
	Hsgrad	No Transformation	Numerator	Lag 0	.242	.245	.986	.032

Model Fit statistics							
Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Normalized BIC
.845	.845	720.865	2.391	540.899	7.270	1577.486	13.559

### Model Findings:

- Enrollment at the University of Hawai'i four-year campuses was strongly correlated with Hawai'i real per capita personal income, unemployment rate, number of high school graduates and prior year four-year campus student enrollment.
- Hawai'i real per capita personal income showed a strong and positive effect on student enrollment. After controlling for other factors, an increase of \$1 million in Hawai'i real per capita personal income contributes a 0.56 unit increase in four-year campus enrollment.
- The model showed that the higher the unemployment rate, the more likely students would enroll in college. Conversely, an improving labor market (lower unemployment rate) may allow more students to opt for work, resulting in lower enrollment.
- The model also showed that the higher the number of high school graduates, the higher the four-year campus student enrollment. Conversely, declining numbers of high school graduates can lower the enrollment.
- Prior four-year campus student enrollment also had a strong and positive effect on current year student enrollment.
- The model predicts that University of Hawai'i four-year campus student enrollment will be growing at a relatively stable and slow pace. The following chart and table show the enrollment forecasts and corresponding 95% upper and lower critical level intervals.



### Transfer Function (Multivariate ARIMA) Model and Projection for UH Mānoa

We identified a different model for UH Mānoa student enrollment: an ARIMA (1,0,0) model with independent variables of Hawai'i real per capita personal income, unemployment rate and number of high school graduates. The estimated model coefficients were all statistically significant at the  $p < 0.01$  level.

Model Description			
			Model Type
Model ID	Manoa	Model_1	ARIMA(1,0,0)

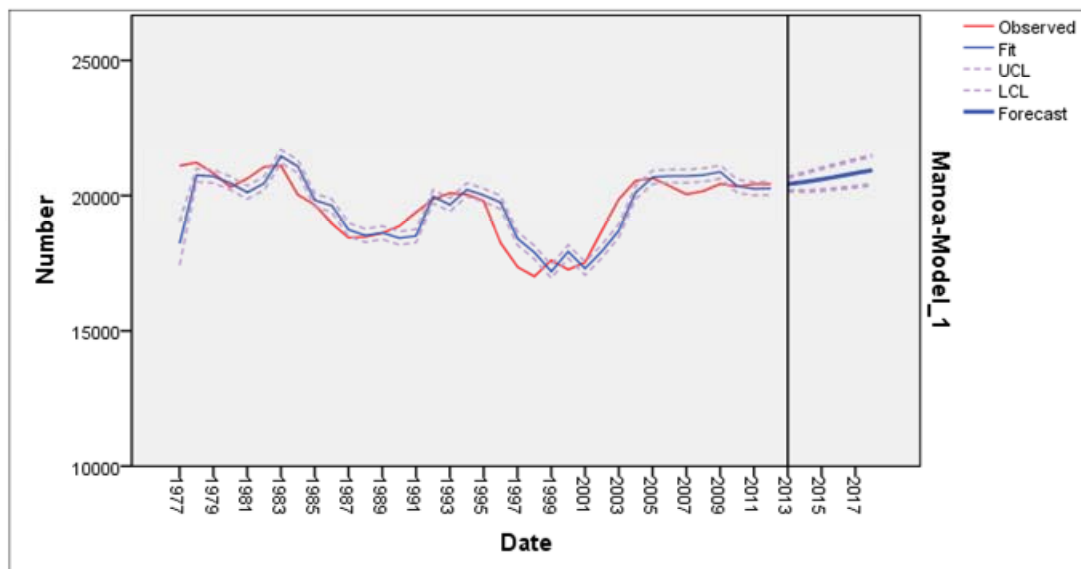
ARIMA Model Parameters								
					Estimate	SE	t	Sig.
Manoa-Model_1	Manoa	No Transformation	AR	Lag 1	.952	.055	17.247	.000
	PI	No Transformation	Numerator	Lag 0	.449	.098	4.570	.000
	Unemrate	No Transformation	Numerator	Lag 0	386.509	138.248	2.796	.009
	Hsgrad	No Transformation	Numerator	Lag 0	.243	.224	1.084	.007

Model Fit statistics							
Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Normalized BIC
.606	.606	795.413	2.727	530.284	13.619	2874.385	13.756

### Model Findings:

- Student enrollment at the University of Hawai'i at Mānoa was strongly correlated with Hawai'i real per capita personal income, unemployment rate, number of high school graduates and prior year student enrollment.
- Hawai'i real per capita personal income showed a strong and positive effect on student enrollment. After controlling for other factors, the model showed that the higher the real per capita personal income the more likely students would enroll in college.

- The model showed that the higher the unemployment rate, the more likely students would enroll in college. Conversely, an improving labor market (lower unemployment rate) may allow more students to opt for work, resulting in lower enrollment.
- The model also showed that the higher the number of high school graduates, the higher the number of students who would enroll in college. Conversely, declining numbers of high school graduates can lower the enrollment.
- The prior year UH Mānoa student enrollment also had a strong effect on the current year student enrollment.
- The model predicts that University of Hawai'i at Mānoa student enrollment will be growing at a relatively slow pace. The following chart and table show the enrollment forecasts and the corresponding 95% upper and lower critical level intervals.



### Transfer Function (Multivariate ARIMA) Models and Projection for UH Hilo and UH West O'ahu

Since the enrollment counts at UH Hilo and UH West O'ahu were relatively small and the growth rates in recent years were quite rapid, statistically significant relationships between the state-wide macro level socioeconomic and demographic factors selected for this study and UH Hilo and UH West O'ahu student enrollment could not be identified. Thus, we used simple ARIMA models for their projection: an ARIMA (1,2,0) model for UH Hilo, and a squared root ARIMA (1,1,0) model for UH West O'ahu. The estimated model coefficients were all statistically significant at  $p < 0.005$  level. The model estimates and projection charts are listed below.

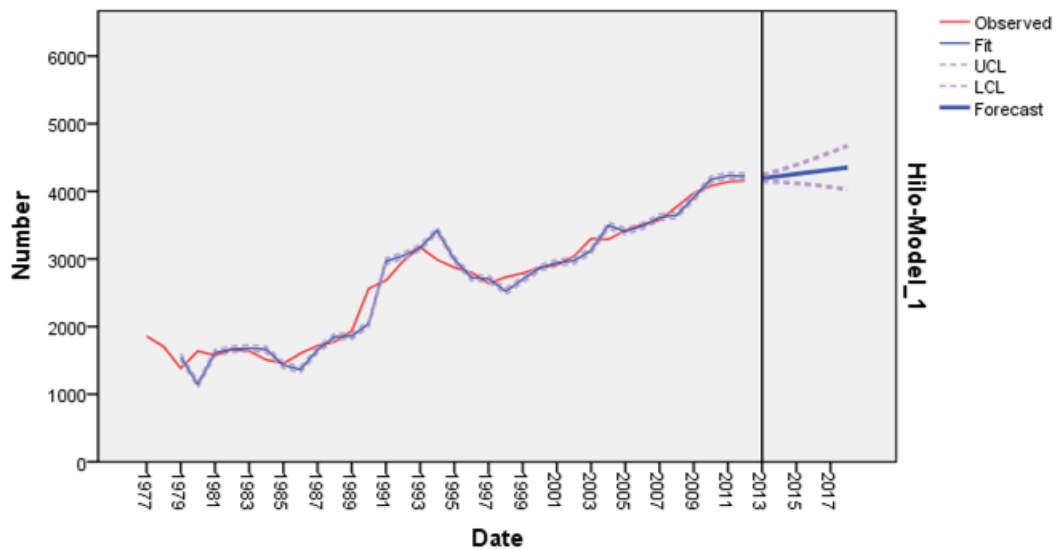
## UH Hilo

ARIMA Model Parameters					Estimate	SE	t	Sig.
Hilo-Model_1	Hilo	No Transformation	AR	Lag 1	-.485	.151	-3.213	.003
			Difference		2			

Model Fit statistics							
Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Normalized BIC
.240	.955	183.884	5.393	125.818	30.082	518.907	10.532

### Model Finding:

- After a period of rapid growth from 1997 to 2009, enrollment growth has slowed over the last several years. The model predicts that student enrollment at the UH Hilo will be growing at a relatively slow pace over the next five years. The following chart and table show the enrollment forecasts and corresponding 95% upper and lower critical level intervals. Note that the model used results in wider intervals than the other models.



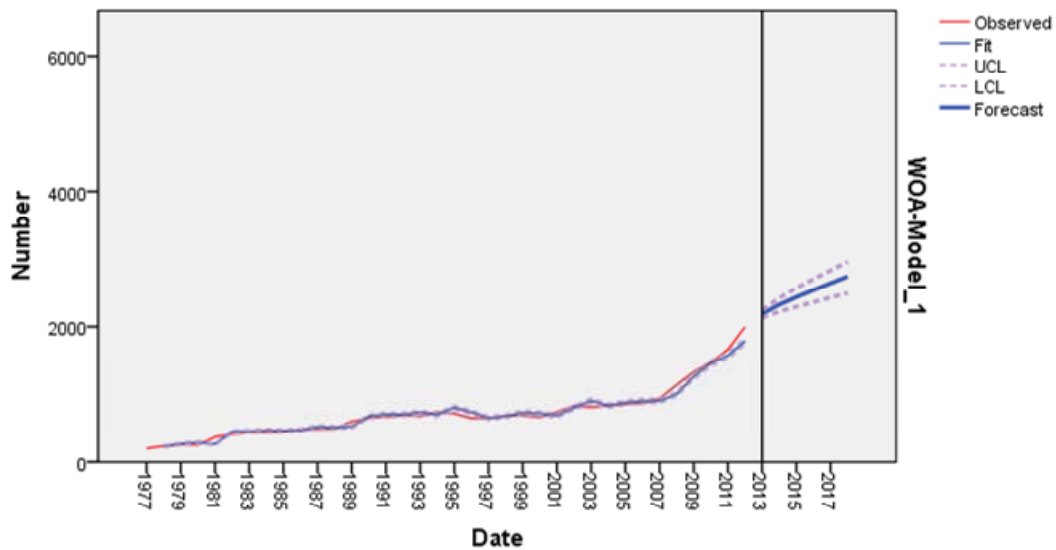
## UH West Oahu

				Estimate	SE	t	Sig.
WOA-Model_1	WOA	Square Root	Constant	.931	.315	2.953	.006
			AR      Lag 1	.394	.180	2.189	.006
			Difference	1			

Model Fit statistics							
Stationary R-squared	R-squared	RMSE	MAPE	MAE	MaxAPE	MaxAE	Normalized BIC
.134	.972	65.696	6.771	47.385	29.020	207.826	8.573

### Model Finding:

- Since the addition of lower division in 2007, enrollment growth at UH West O'ahu has demonstrated a strong upward trend. The model predicts that student enrollment at UH West O'ahu will be growing at a relatively strong but slower pace over the next five years. The following chart and table show the enrollment forecasts and corresponding 95% upper and lower critical level intervals.



## Appendix

Definitions of the goodness-of-fit measures used in time series modeling:

- **Stationary R-squared.** A measure that compares the stationary part of the model to a simple mean model. This measure is preferable to an ordinary R-squared when there is a trend or seasonal pattern. Stationary R-squared can be negative with a range of negative infinity to 1. Negative values mean that the model under consideration is worse than the baseline model. Positive values mean that the model under consideration is better than the baseline model.
- **R-squared.** An estimate of the proportion of the total variation in the series that is explained by the model. This measure is most useful when the series is stationary. R-squared can be negative with a range of negative infinity to 1. Negative values mean that the model under consideration is worse than the baseline model. Positive values mean that the model under consideration is better than the baseline model.
- **RMSE.** Root Mean Square Error. The square root of mean square error. A measure of how much a dependent series varies from its model-predicted level, expressed in the same units as the dependent series.
- **MAPE.** Mean Absolute Percentage Error. A measure of how much a dependent series varies from its model-predicted level. It is independent of the units used and can therefore be used to compare series with different units.
- **MAE.** Mean Absolute Error. Measures how much the series varies from its model-predicted level. MAE is reported in the original series units.
- **MaxAPE.** Maximum Absolute Percentage Error. The largest forecasted error, expressed as a percentage. This measure is useful for imagining a worst-case scenario for the forecasts.
- **MaxAE.** Maximum Absolute Error. The largest forecasted error, expressed in the same units as the dependent series. Like MaxAPE, it is useful for modeling the worst-case scenario for the forecasts. Maximum absolute error and maximum absolute percentage error may occur at different series points – for example, when the absolute error for a large series value is slightly larger than the absolute error for a small series value. In that case, the maximum absolute error will occur at the larger series value and the maximum absolute percentage error will occur at the smaller series value.
- **Normalized BIC.** Normalized Bayesian Information Criterion. A general measure of the overall fit of a model that attempts to account for model complexity. It is a score based upon the mean square error and includes a penalty for the number of parameters in the model and the length of the series. The penalty removes the advantage of models with more parameters, making the statistic easy to compare across different models for the same series.

## References

- Box, G.E.P. & Jenkins, G.M.M. (2008). Time Series Analysis: Forecasting and Control, 4<sup>th</sup> ed., (Wiley Series in Probability and Statistics).
- Chen, C.K. (2008). An Integrated Enrollment Forecast Model. IR Applications, Volume 15, Association of Institutional Research.
- Hawai'i State Department of Business, Economic Development and Tourism (DBEDT). State of Hawai'i Data Book, 2011.
- Hawai'i State Department of Business, Economic Development and Tourism (DBEDT). Quarterly Statistical & Economic Report (QSER), May 2013.
- Hawai'i State Department of Education. Hawaii Public School Official Enrollment Count.
- Hawai'i State Department of Labor. Monthly Local Area Unemployment Statistics (LAUS), May 2013.
- Pindyck, P.S. & Rubinfeld, D.L. (1998). Econometric Models and Economic Forecasts, 4<sup>th</sup> ed., McGraw-Hill.
- Reiss, Elayne (2013). Best Practices in Enrollment Modeling: Understanding Processes and Methods. 2013 AIR Conference.
- University of Hawai'i Institutional Research and Analysis Office (2012). Enrollment Projections, University of Hawai'i, Fall 2012 to Fall 2017.
- Western Interstate Commission for Higher Education. Hawai'i Public and Private High School Graduates.