A Time Series Econometric Forecast for the Levels of Outstanding Student Loans Owned and Securitized in the U.S.

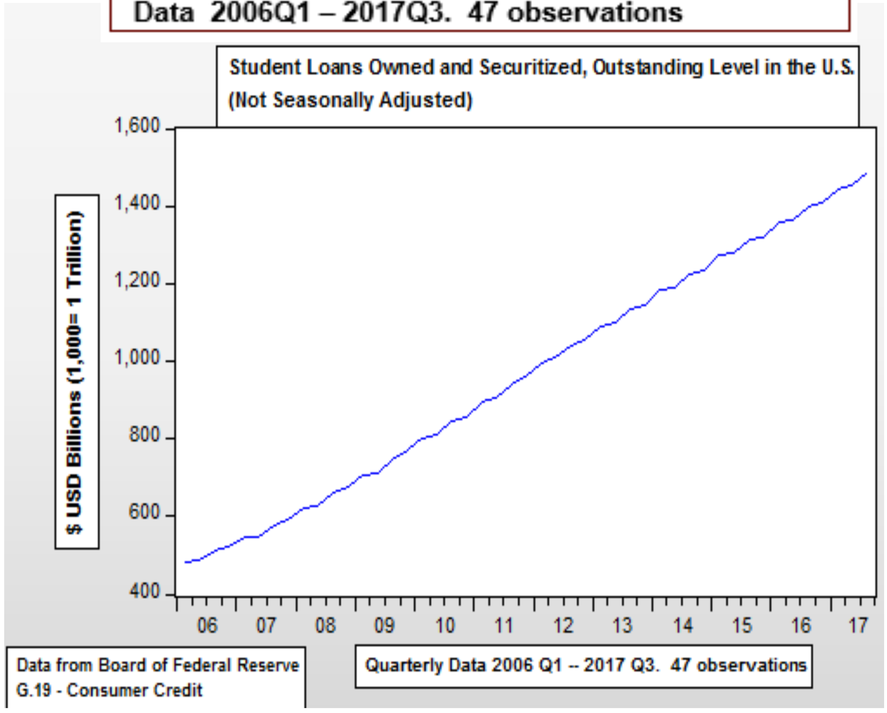
Daniel Plessner & Jason Hecht Ph.D.
Anisfield School of Business, Ramapo College of New Jersey, Mahwah, NJ, 07430

Outstanding Student Loans Owned and Securitized in the U.S (referred to as SLOAS)

Quarterly household U.S. finance measurement included in the **Consumer Credit G.19 report by the Board of Governors of the Federal Reserve System**

Includes student loans originated under the Federal Family Education Loan Program and the Direct Loan Program; Perkins loans; and private student loans without government guarantees

$ Billions, Not Seasonally Adjusted, End of Quarter Data 2006Q1 – 2017Q3. 47 observations



Modelling Techniques using Unit Root Tests and Box-Jenkins Method

SLOAS is I(1) integrated of order 1, and is trend stationary

Log(SLOAS) is I(2) integrated of order 2, and is not trend stationary

ARIMA (p,d,q) for SLOAS is ARIMA (1,1,1)
ARIMA (p,d,q) for Log(SLOAS) is ARIMA (5,2,1)

Identified ARIMA models expected to not have autocorrelation!

- Durbin-Watson statistics and Correlograms of squared residuals supported a white noise residual and no remaining autocorrelation

Literature Review and Motivation

Nelson and Plosser (1982) found that the existence of non-stationarity in many real and nominal macroeconomic variables could be explained by stationary first differences accumulating over long periods of time.

The existence of a unit root means the data is non-stationary, which can make econometric modelling both easier and more difficult due to the reliability of different statistical test outcomes in finite samples (Campbell, Perron 1991).

Time series statistical models / regressions usually require the variable to be a time invariant stationary process.

- Unconditional joint probability distribution constant over time
- Mean and Variance parameters constant over time
- Difficult for Variance to remain time invariant in real data
- Instead could try weak stationarity. Mean and Autocovariance (Autocorrelation) stationary

Primary Goals of My Research

- Attempt to find the best univariate model estimation of the student loans variable (using EViews 9 Software)
- In-sample forecast accuracy comparisons (ex-post forecasts)
- Out-of-sample projections of likely future values (ex-ante forecasts)

Econometric Models estimated 2006Q1 - 2015Q3
Generated Ex Post Forecasts for 2015Q4 - 2017Q3
Compared forecasts to the actual values of Student Loans for the 8 ex-post time periods
Mean Absolute Percentage Error and Root Mean Square Error assess forecasting error

Overall Rank	Model	Root Mean Square Error	Mean Abs. % Error
1	ARIMA111	1.34 (1st) excellent	0.254% (1st) excellent
2	Combined Weighted	1.63 (2nd) excellent	0.763% (2nd) very good
3	Triple Exponential	2.68 (3rd) very good	0.777% (4th) very good
4	ARIMAlog521	4.14 (4th) decent	0.764% (3rd) very good
5	Linear Time Trend	6.84 (6th) not good	1.289% (5th) decent
6	Double Exponential	6.77 (5th) not good	1.578% (6th) decent
7	Single Exponential	51.46 (7th) bad	16.292% (7th) bad

Ex Ante Forecasting		Ex-Post #1	Ex-Post #2	Ex-Post #3	Ex-Post #4
		ARIMA(1,1,1)	Combined	Triple Exponential Smoothing	ARIMAlog(5,2,1)
Quarter	Actual				
2017:4	$1,490.81	$1,491.21 (+/- 5.0)	$ 1,505.59	$ 1,493.54	$1,495.26 (+/- 7.5)
2018:1	N/A	$1,528.0 (+/- 6.6)	$ 1,544.47	$ 1,535.21	$1,529.85 (+/- 9.3)
2018:2	N/A	$1,532.96 (+/- 8.4)	$ 1,556.21	$ 1,538.51	$1,538.91 (+/- 11.1)
2018:3	N/A	$1,568.03 (+/- 9.5)	$ 1,590.41	$ 1,573.75	$1,573.48 (+/- 14.0)
2018:4	N/A	$1,571.92 (+/- 10.9)	$ 1,604.74	$ 1,580.88	$1,582.57 (+/- 18.2)
2019:1	N/A	$1,606.83 (+/- 11.9)	$ 1,644.25	$ 1,623.69	$1,617.11 (+/- 22.8)
2019:2	N/A	$1,610.36 (+/-13.1)	$ 1,655.10	$ 1,625.92	$1,626.22 (+/- 26.9)
2019:3	N/A	$1,644.58 (+/-14.1)	$ 1,689.76	$ 1,661.91	$1,660.75 (+/- 31.4)

Based on these projections, it's expected that the outstanding student loans market will increase by over $110 billion from the start of 2018 to reach $1.6 Trillion in 1st Quarter 2019