

## NEW PREPAYMENT MODEL: AUTO LOANS

### Summary:

Andrew Davidson & Co. (AD&Co) is currently developing several sector-specific asset backed security prepayment models using time series-cross sectional data provided by Bloomberg. In this issue we will discuss the features of the Auto Loan Prepayment model.

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### The Data:

AD&Co has acquired an extensive time series-cross sectional database of automobile loan pools' prepayment histories. This database consists of over 250 loan pools originated with a wide range of coupon rates and tracked over several years. This presents a unique opportunity to model the prepayment behavior of auto loans.

As a result of a study of the data, AD&Co has developed econometric models that capture the specific prepayment characteristics of auto loans.

### The Model:

An analysis of the data reveals that the WACs form three distinct clusters:

- “L” Low Rates. These pools have weighted average coupon rates <6%.
- “N” New Car Rates. These loan pools have WACs in the range of 6%-17%.
- “U” Used Cars Rates. These pools have the highest WACs of >17%.

These names are purely for convenience and do not necessarily reflect the actual status of the car. The higher rates could reflect credit-impaired borrowers or other factors. It was determined that the prepayment behaviors for each cluster of WACs are sufficiently different to warrant three separate submodels. However, the user may elect to forecast using a model estimated from a pooled database of all coupon rates.

Common to all ABS models are general factors that usually affect prepayments:

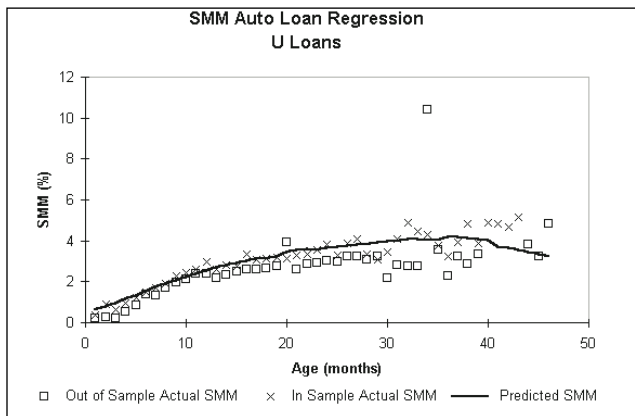
- 1) Coupon Effect
- 2) Age Effect
- 3) Collateral Effect
- 4) Interest Rate Effect
- 5) Seasonality Effect

The auto loans exhibit prepayment characteristics that are quite sensitive to the WAC and, as previously mentioned, which are specific to the coupon range. We observed prepayment behaviors that are not captured by simplistic linear relationships. Advanced econometric estimation techniques are used to handle these non-linear relationships. Although the amortization periods for auto loans rarely exceed five years, during that time the prepayments are very sensitive to the ages of the pools. Moreover, these relationships are non-linear and estimated using the appropriate techniques. The auto loans' collateral types capture various credit effects that can impact prepayment rates. This is accounted for by estimating three distinct submodels. This approach was found to

increase the predictive abilities of the submodels. Because auto loans have such short amortization terms the incentives to refinance or prepay are not especially sensitive to the general interest rate environment. Thus the Interest Rate Effect is omitted from the models since it does not contribute to their predictability. Seasonality effects were detected in the prepayments rates. The AD&Co submodels account for seasonality, but are also presented in simplified versions without seasonality corrections. Users faced with calculational constraints may find this feature useful.

All of the submodels have been rigorously tested and perform well over large time periods. The graph below shows the fit of the “U” loans submodel with no seasonality effects. The model fits both the in-and out-of-sample data very well.

**Graph 1**

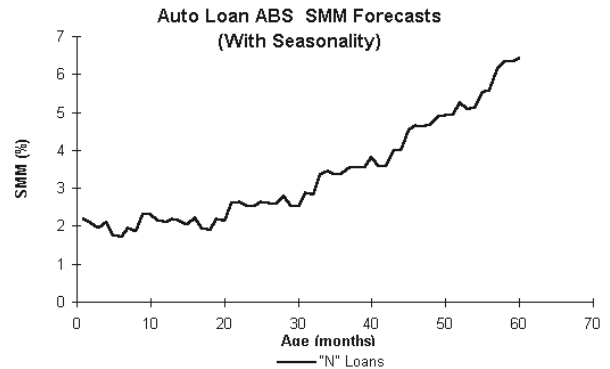


**Model Usage:**

The AD&Co Auto Loan Prepayment model allows the user to input loan pool characteristics and calculates the SMM or ABS measures of prepayments. In addition, the model lets the user omit the seasonality correction and/or forecast from the pooled-data model.

An example of the forecasted SMM for “N” loans with seasonality is shown below:

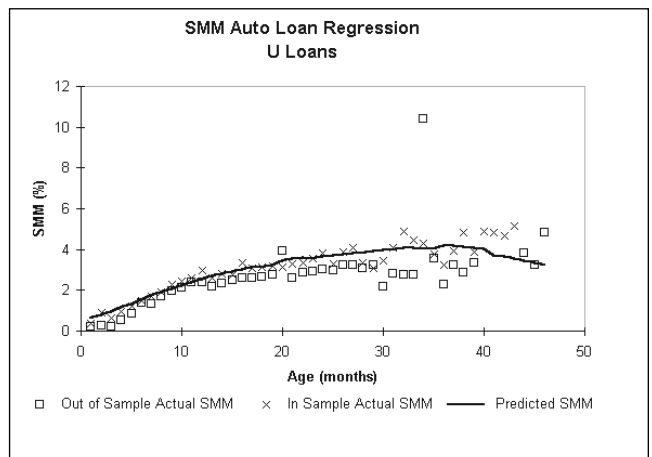
**Graph 2**



The model can also produce a graph of the pool's forecasted amortization and has the capability to introduce error terms into the forecast and show their effects.

An example of the graph of the forecasted amortization is:

**Graph 3**



**Conclusion:**

AD&Co's Auto Loan Prepayment model is highly predictive and the result of sophisticated econometric techniques that capture the complex underlying factors affecting prepayment behavior. The model is easy to implement and can be used for forecasting, loss estimation, risk and OAS analyses.

Work has also been done on issuer specific effects. It has been determined that certain auto loan ABS

issuers have prepayment rates that are statistically higher or lower than the model predicts. Future releases of the AD&Co Auto Loan Prepayment model may incorporate issuer specific adjustments into its forecasts.

AD&Co is continually refining and reestimating the model as more data become available to ensure the highest predictive ability.

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## Quantitative Analysis

FNMA 30 Year			MARKET July Settlement 6/5/98		SPREAD TO			OPTIONS ANALYSIS			RISK		
CPN	WAM	AGE	Price	Yield	WAL TRSY	Zero Curve	Fwd Curve	OAS	Option Cost	Fwd Curve Effect	Mod Dur	Eff Dur	Convex
6.0	341	19	96-29	6.53	96	99	99	58	41	0	6.2	4.6	-0.9
6.5	355	5	99- 9	6.64	107	110	109	48	61	1	6.5	4.0	-1.4
7.0	355	5	101-10	6.70	111	114	113	47	65	2	4.4	3.1	-1.4
7.5	352	8	102-22	6.69	111	109	107	47	60	2	3.4	2.2	-1.3
8.0	352	8	103-24	6.55	98	90	88	43	45	2	2.6	1.5	-0.9
8.5	350	10	104-22	6.36	79	67	64	33	31	3	2.3	1.1	-0.5
9.0	335	25	105-30	6.44	87	79	76	57	19	3	2.4	1.4	-0.2
9.5	321	39	106-29	6.70	113	112	109	104	5	3	2.6	1.9	0.1

		PREPAYMENT				PREPAYMENT DURATION				TSY HEDGE POSITIONS			
CPN	Price	Base PSA	FWD PSA	Base WAL	FWD WAL	Scale	Steep	Slide	Burn	2 Year	5 Year	10 Year	30 Year
6.0	96-29	127	127	9.2	9.2	0.10	-0.27	-0.01	0.00	0.80	0.24	0.24	0.05
6.5	99- 9	132	162	9.8	8.6	-0.02	-0.22	-0.34	-0.01	0.98	0.20	0.19	0.03
7.0	101-10	277	290	5.9	5.6	-0.15	-0.18	-0.52	-0.01	1.01	0.16	0.12	0.02
7.5	102-22	384	398	4.3	4.2	-0.25	-0.19	-0.79	-0.01	0.97	0.12	0.05	0.01
8.0	103-24	532	544	3.2	3.1	-0.37	-0.24	-0.91	-0.01	0.86	0.10	0.01	0.00
8.5	104-22	628	639	2.6	2.6	-0.49	-0.31	-1.02	-0.02	0.71	0.10	-0.02	-0.01
9.0	105-30	491	499	2.9	2.8	-0.59	-0.38	-0.98	-0.04	0.62	0.15	0.01	-0.01
9.5	106-29	454	460	3.1	3.0	-0.58	-0.42	-0.79	-0.12	0.62	0.21	0.04	-0.01

GNMA 30 Year			MARKET July Settlement 6/5/98		SPREAD TO			OPTIONS ANALYSIS			RISK		
CPN	WAM	AGE	Price	Yield	WAL TRSY	Zero Curve	Fwd Curve	OAS	Option Cost	Fwd Curve Effect	Mod Dur	Eff Dur	Convex
6.0	339	21	97- 7	6.50	93	95	95	51	44	0	6.3	5.4	-1.0
6.5	348	12	99-14	6.64	107	109	109	53	56	0	6.1	4.6	-1.4
7.0	354	6	101-14	6.79	122	125	124	54	70	1	5.9	3.7	-1.8
7.5	353	7	102-29	6.92	133	136	134	57	77	2	4.7	2.5	-2.0
8.0	353	7	103-31	6.90	131	130	127	58	69	3	3.5	1.4	-1.7
8.5	352	8	105-21	6.26	69	56	53	13	40	3	2.5	0.3	-0.9
9.0	329	31	107- 4	6.00	43	35	32	7	25	3	2.4	0.6	-0.3
9.5	321	39	108- 0	6.25	68	62	59	48	11	3	2.6	1.2	0.0

		PREPAYMENT				PREPAYMENT DURATION				TSY HEDGE POSITIONS			
CPN	Price	Base PSA	FWD PSA	Base WAL	FWD WAL	Scale	Steep	Slide	Burn	2 Year	5 Year	10 Year	30 Year
6.0	97- 7	125	128	9.2	9.1	0.03	-0.19	-0.09	0.00	0.79	0.25	0.30	0.07
6.5	99-14	142	144	8.9	8.9	-0.06	-0.16	-0.32	-0.01	0.95	0.24	0.24	0.05
7.0	101-14	162	168	8.6	8.4	-0.15	-0.16	-0.64	-0.01	1.08	0.19	0.17	0.03
7.5	102-29	234	246	6.6	6.3	-0.23	-0.17	-0.95	-0.01	1.08	0.15	0.08	0.01
8.0	103-31	366	382	4.6	4.4	-0.32	-0.20	-1.34	-0.01	1.01	0.11	-0.01	0.00
8.5	105-21	572	583	3.0	2.9	-0.53	-0.29	-2.17	-0.02	0.81	0.08	-0.09	-0.02
9.0	107- 4	485	492	2.9	2.8	-0.68	-0.37	-1.69	-0.04	0.64	0.12	-0.07	-0.02
9.5	108- 0	466	472	3.0	3.0	-0.71	-0.40	-1.32	-0.09	0.59	0.17	-0.02	-0.01