

Dollar Tree: EPS Prediction Report

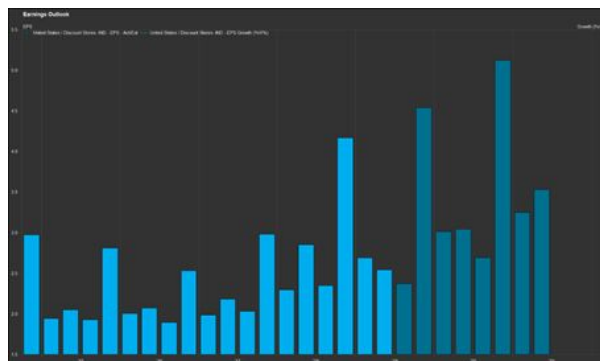
Equity research analysts: Adam Salem(47511247), Elena Liang (48082012),
Han Chun Lin (48072028), Meng Chu Wang (47959201), Yan Li (48081999)

Executive Summary

This report provides an analysis and forecast for the upcoming 3rd quarter of 2019 EPS of Dollar Tree, Inc. Methods of analysis include Winter's method, Decomposition method, and ARIMA model. Detail calculations can be found in the appendices. The result of the analysis shows an increasing trend and seasonal pattern of company's EPS; the prediction of the next quarter is around \$1.032 using weighted average of the three models. The report also investigates the competitors in the industry, government regulations, and economic conditions that may influence the future earnings per share.

Company Overview

Dollar Tree Stores, Inc., formerly known as Only \$1.00, is an American discount store chain that sell items for \$1 or less. It is a Fortune 500 company and operates 14,835 stores throughout the 48 contiguous U.S. states and Canada. Its stores are supported by a nationwide logistics network of eleven distribution centers. The company operates one-dollar stores under the names of Dollar Tree and Dollar Bills. The company also operates a multi-price-point variety chain under Family Dollar. Dollar Tree has grown steadily for decades and showed a seasonality pattern in their earning per share.



Quarterly EPS Bar Plot (Image source: Factset)

Industry and Government Overview

A discount store is a retail store that sells a wide range of inexpensive household goods, including fresh produce, personal hygiene products, small home and garden tools, office supplies, decorations, electronics, garden plants, toys, pet supplies, remaindered books, recorded media, and other consumables.

Profit Model

The main ways that discount stores make a profit are:

- Get a small profit margin through buying and selling huge amounts of goods at heavily discounted prices, and multiply the margin by the volume of sales.
- Pricing items at prices higher than regular retailers. These items are commonly bought by consumers who perceive them to be bargains based on the heavy discounts on other items in the store.

Sources of Supply

There are two sources of stock for the discount stores:

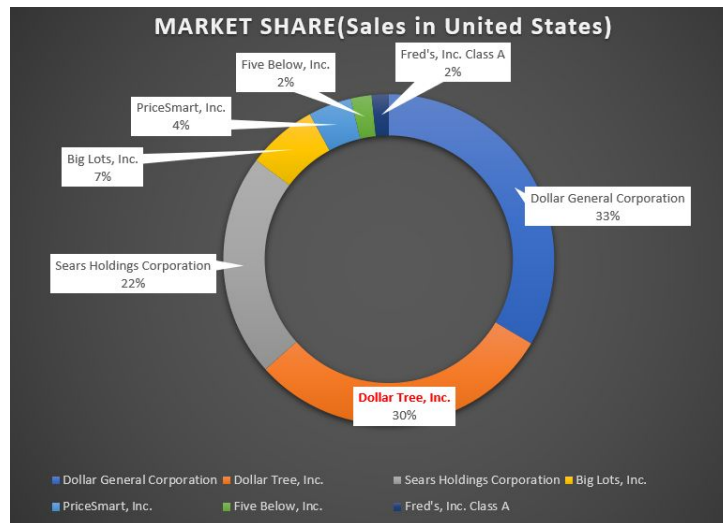
- Imported from other countries with lower variable costs, because of differences in wages, resource costs or taxation. Usually, goods are imported by a general importer, then sold to the stores wholesale.

- Overruns, which are surplus items and out-of-date food products.

Competitors

Key competitors for Dollar Tree Stores are:

- In the United States: Dollar General, Sears Holdings, Big Lots, PriceSmart, Five Below, Fred's
- In Canada: A Buck or Two, Dollarama, Everything For a Dollar Store, Great Canadian Dollar Store, Your Dollar Store With More



Doughnut Chart of Market Share (Data source: Factset)

Regulation& Policy

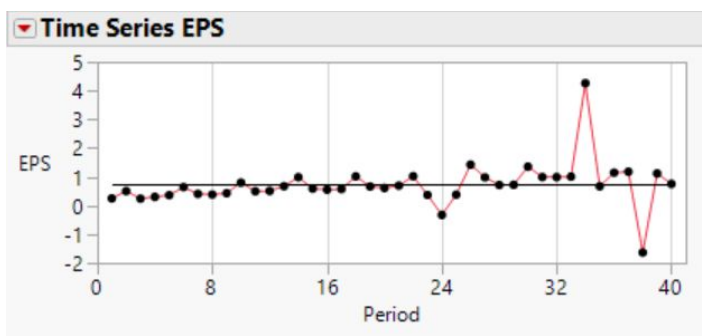
Regulations relevant to this sector are generally covered at the state level. Companies must comply with the Fair Labor Standards Act and various state laws governing matters such as minimum wage, overtime, and other working conditions. Store owners must also comply with the provisions of the Americans with Disabilities Act of 1990.

International Connection

Globalization for this industry has been increasing due to the influx of less expensive merchandise imported from Asian countries, particularly China.

Data Gathering and Examination

The Earnings Per Share(EPS) data was acquired through FactSet Research Systems, 40 quarters of data from Q3 2009 to Q2 2019 was collected. The time series plot is provided below:

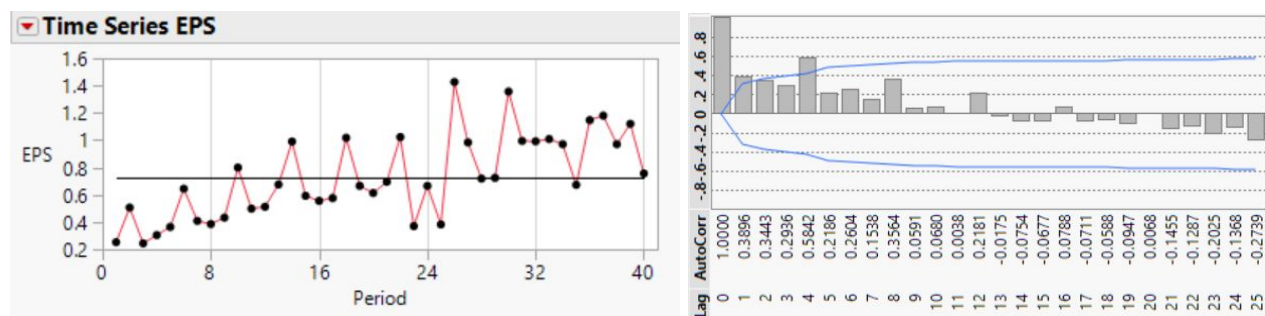


The time series plot shows an increasing trend with seasonality; however, we observed 3 significant fluctuations (short term shocks) in the data, one large EPS above \$4 and two negative EPS. We did some research to find out if there were any specific reasons behind these fluctuations.

The three fluctuations are due to the following reasons:

1. The first shock happened in Q2 of 2015 and EPS was -\$0.32. During this quarter, Dollar Tree completed the purchase of Family Dollar Stores. Because of the acquisition, the net income was negatively impacted by the overall lower-margin product mix for the Family Dollar segment and the acquisition-related interest expense.
2. The second shock happened in Q4 of 2017 and EPS was \$4.26. During this quarter, the federal corporate tax rate was reduced from 35% to 21 % effective January 1, 2018, which caused a benefit of \$583.7 million in net income.
3. The third shock happened in Q4 of 2018 and EPS was -\$1.63. During this quarter, Dollar Tree recorded a \$2.73 billion non-cash goodwill impairment charge related to Family Dollar, causing a significant increase in Expense and in turn a net loss.

Based on the above information, these three abnormal EPS were considered short term shocks and should be excluded from the prediction process. We replaced these three outliers with the mean value of EPS from the corresponding quarters. The new time series plot and Auto Correlation Function is provided below.



According to the time series plot, EPS of Dollar Tree might possibly be seasonal because Q4 always has the highest EPS compared with the other three seasons in general. Besides, ACF also supports our guess. The 4th lag is significantly positive and larger than other lag autocorrelation data. We possessed quarterly data, so a seasonality of quarter is plausible.

Model Construction and EPS Prediction

Since the data has seasonality, we decided to choose the models that consider seasonality, including Winter's method, Decomposition method, and ARIMA model. We ran the models using both 5-year data and 10-year data and found out that 10-year data could make a better prediction with smaller errors. So 10-year data was used in the models.

Winter's method is one of the smoothing methods which captures both trend and seasonality characteristics of the data. When doing the prediction, three components including level (mean), trend and seasonality are forecasted individually to get the predicted value. Please refer to Appendix A for detailed information.

Decomposition method tries to identify different components of the basic underlying pattern, including trend, seasonality, cyclical, irregular, and cycle. Each component is estimated to predict the entire time series. Using this method, we decomposed each part of a time series and synthesized the different components to make the forecast. Please refer to Appendix B for detailed information.

ARIMA stands for Autoregressive Integrated Moving Average model. It uses a number of lagged observations of time series to forecast observations. A weight is applied to each of the past terms and the weights can vary based on how recent they are. Please refer to Appendix C for detailed information.

The projected EPS for Q3 2019 is shown below:

Method	Predicted EPS	MSE	MAPE
Winter's Method	\$1.02	0.0504	26.647%
Decomposition Method	\$1.03	0.0254	17.424%
ARIMA Model	\$1.04	0.0296	18.9743%

After comparing and checking the model adequacy of these three models, the decomposition Method has the smallest MSE and MAPE, followed by ARIMA Model, and Winter's Method.

Final EPS Prediction

After comparing the MSE and MAPE, we finalized our prediction by assigning different weights to all three models. Since Decomposition Method and ARIMA Model have really close MSE results that are lower than Winter's Method, we decided to assign more weight to these two methods. The assigned weights are listed below.

Winter's Method: 20%; Decomposition Method: 40%; ARIMA Model: 40%

As a result, our prediction for the earnings per share for Dollar Tree in 2019 Q3 is:

$$\$1.02 * 0.2 + \$1.03 * 0.4 + \$1.03 * 0.4 = \$1.032$$

Risks of Dollar Tree

As many other retailers in the US, Dollar Tree depends heavily on the global supply chain. Recently, the US president Donald Trump administration has escalated trade fight with China. Trump has slapped around 10 percent tariff on \$200 billion worth of Chinese imports which hits the everyday consumer items (Al-Muslim). Therefore, Dollar Tree might need to pull many items off shelves or take other steps to offset the higher costs. A high majority of inexpensive products are made in China. Dollar Tree imports total about 42 percent of its products (Davidson), which is almost half of their selling items. The main issue with tariffs is leading Dollar Tree to pay more for imports, which might lead to higher prices. The Dollar stores are especially budget-constrained and could be hurt by what is essentially a new tax on their purchases. Dollar Tree simply can't raise prices at their stores, because their strategy is built on selling everything around \$1.

As a result, if the U.S.-China political complications, customers are likely to see slightly less merchandise in stores, smaller packages at the same price for certain items and perhaps some higher prices at Dollar Tree shops. Therefore, uncontrollable factors that affect the supply chain such as tariffs could make Dollar Tree's stores less competitive with higher-priced discount retailers, which results in slower growth (Zumbrun). The tariffs, if sustained, would continue to shave company revenue by delaying new store openings, limiting the need for new distribution centers, and curtailing hiring.

Another risk might be the fluctuation of the unemployment rate. The unemployment rate is positively correlated to the demand of variety stores. Most of the consumers are budget-conscious and more likely to shop at dollar stores when unemployment rate rises. Since January 2019, the unemployment rate in most of the states has decreased (Herman), which may lower the sales.

Appendices

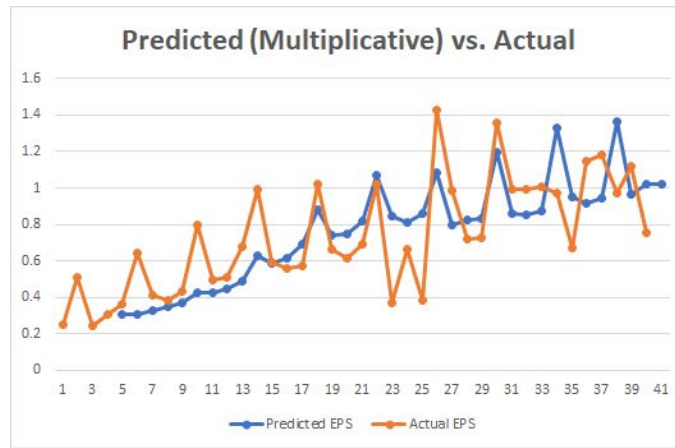
Appendix A: Winter's Method

- Model

Period	Year	Quarter	EPS	Forecast	Level	Trend	Seasonality	Error	Error^2
1	2009	3	0.252874				100%		
2	2009	4	0.506667				100%		
3	2010	1	0.24424				100%		
4	2010	2	0.30445		0.30445	0	100%		
5	2010	3	0.364632	0.30445	0.306705	0.001531	102%	0.060182	0.003622
6	2010	4	0.645	0.308235	0.320851	0.010097	113%	0.336765	0.11341
7	2011	1	0.408907	0.330948	0.333868	0.01208	103%	0.077959	0.006078
8	2011	2	0.385772	0.345948	0.34744	0.013093	101%	0.039824	0.001586
9	2011	3	0.432891	0.369199	0.362863	0.014675	105%	0.063692	0.004057
10	2011	4	0.8	0.42608	0.38995	0.023102	125%	0.37392	0.139816
11	2012	1	0.498711	0.424867	0.415741	0.024928	105%	0.073844	0.005453
12	2012	2	0.512468	0.446857	0.443094	0.026574	103%	0.065611	0.004305
13	2012	3	0.675652	0.491056	0.476282	0.031065	109%	0.184596	0.034076
14	2012	4	0.990897	0.632175	0.518132	0.038388	133%	0.358722	0.128682
15	2013	1	0.592806	0.584548	0.556815	0.038588	105%	0.008258	6.82E-05
16	2013	2	0.555952	0.614563	0.593276	0.037144	102%	-0.05861	0.003435
17	2013	3	0.576287	0.689059	0.626554	0.034519	107%	-0.11277	0.012717
18	2013	4	1.018156	0.87979	0.664968	0.037164	136%	0.138366	0.019145
19	2014	1	0.665864	0.738769	0.699536	0.035401	104%	-0.0729	0.005315
20	2014	2	0.613504	0.749694	0.729936	0.032005	100%	-0.13619	0.018548
21	2014	3	0.695257	0.816015	0.757718	0.029137	105%	-0.12076	0.014583
22	2014	4	1.023743	1.067243	0.785653	0.028322	135%	-0.0435	0.001892
23	2015	1	0.370739	0.846056	0.796844	0.01669	97%	-0.47532	0.225926
24	2015	2	0.665362	0.811274	0.808052	0.012968	98%	-0.14591	0.02129
25	2015	3	0.38252	0.863258	0.803892	0.001338	98%	-0.48074	0.231109
26	2015	4	1.427415	1.086704	0.814688	0.00776	140%	0.340711	0.116084
27	2016	1	0.984349	0.794765	0.829797	0.01275	99%	0.189584	0.035942
28	2016	2	0.719054	0.821569	0.838608	0.010076	96%	-0.10252	0.010509
29	2016	3	0.724356	0.830174	0.844632	0.007324	96%	-0.10582	0.011197
30	2016	4	1.357233	1.19341	0.856337	0.010299	142%	0.163823	0.026838
31	2017	1	0.99507	0.861721	0.87166	0.01371	101%	0.133349	0.017782
32	2017	2	0.992502	0.850068	0.890927	0.017484	98%	0.142434	0.020287
33	2017	3	1.008831	0.874656	0.913632	0.021028	98%	0.134175	0.018003
34	2017	4	0.971139	1.331164	0.92519	0.014598	138%	-0.36003	0.129618
35	2018	1	0.672956	0.952071	0.929467	0.00759	98%	-0.27911	0.077905
36	2018	2	1.147946	0.918046	0.945848	0.013559	101%	0.2299	0.052854
37	2018	3	1.180561	0.941017	0.968556	0.019771	101%	0.239544	0.057381
38	2018	4	0.971139	1.360486	0.977732	0.012577	133%	-0.38935	0.151592
39	2019	1	1.120452	0.966822	0.996204	0.01658	100%	0.15363	0.023602
40	2019	2	0.756609	1.022391	1.00292	0.009883	98%	-0.26578	0.07064
41	2019	3		1.024074					
								MSE	0.050426

- Model Result

- The predicted EPS for Q3 2019 is \$1.02
- MSE is 0.050426
- Predicted vs. Actual EPS



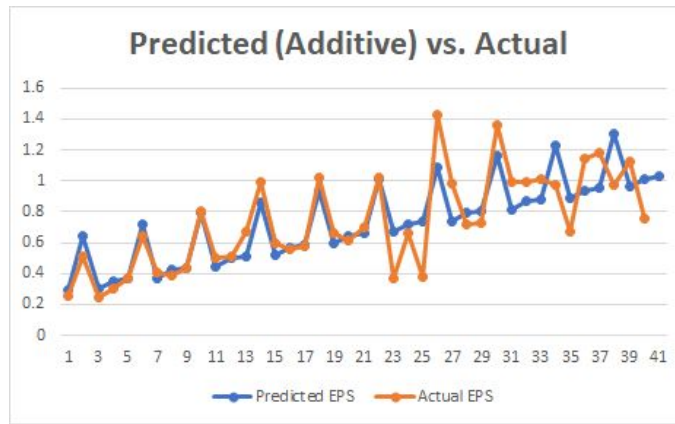
Appendix B: Decomposition Method

- Model

Period	Year	Quarter	Actual EPS	4MA	2x4MA	Detrend	Seasonal Index	Irregular	Seasonally Adjusted	Cycle	Pure Irregular	Trend	Predicted EPS	Error	Error_sq
1	2009	Q3	0.25				-0.08		0.33			0.37148	0.292298888	-0.04	0.00155
2	2009	Q4	0.51	0.33			0.25		0.25277			0.38988	0.643777636	-0.14	0.01880
3	2010	Q1	0.24	0.35	0.34	-0.0968	-0.11	0.01192	0.35295			0.40828	0.299576783	-0.06	0.00306
4	2010	Q2	0.30	0.39	0.3722889	-0.0678	-0.08	0.00872	0.38101	0.0181	-0.0094	0.42669	0.350128826	-0.05	0.00209
5	2010	Q3	0.36	0.4307	0.4101639	-0.0455	-0.08	0.03365	0.44381	-0.0025	0.03613	0.44509	0.365907935	0.00	0.00000
6	2010	Q4	0.65	0.4511	0.4409125	0.20409	0.25	-0.04981	0.3911	0.01395	-0.0638	0.46349	0.717386683	-0.07	0.00524
7	2011	Q1	0.41	0.4681	0.4596101	-0.0507	-0.11	0.058	0.51761	-0.0057	0.06367	0.48189	0.37318583	0.04	0.00128
8	2011	Q2	0.39	0.5069	0.4875175	-0.1017	-0.08	-0.02519	0.46233	0.00892	-0.0341	0.5003	0.423737873	-0.04	0.00144
9	2011	Q3	0.43	0.5293	0.518118	-0.0852	-0.08	-0.00605	0.51207	-0.0101	0.00406	0.5187	0.439516982	-0.01	0.00004
10	2011	Q4	0.80	0.561	0.5451805	0.25482	0.25	0.00092	0.5461	0.00364	-0.0027	0.5371	0.79099573	0.01	0.00008
11	2012	Q1	0.50	0.6217	0.5913626	-0.0927	-0.11	0.01606	0.60742	-0.0132	0.02924	0.5555	0.446794877	0.05	0.00270
12	2012	Q2	0.51	0.6694	0.6455699	-0.1331	-0.08	-0.05654	0.58903	0.01105	-0.0676	0.5739	0.49734692	0.02	0.00023
13	2012	Q3	0.68	0.693	0.6811939	-0.0055	-0.08	0.07364	0.75483	0.01857	0.05507	0.59231	0.513126029	0.16	0.02641
14	2012	Q4	0.99	0.70	0.6983913	0.29251	0.25	0.03861	0.737	0.04079	-0.0022	0.61071	0.864604777	0.13	0.01595
15	2013	Q1	0.59	0.68	0.6914061	-0.0986	-0.11	0.01011	0.70151	-0.0004	0.0105	0.62911	0.520403924	0.07	0.00524
16	2013	Q2	0.56	0.69	0.6823929	-0.1264	-0.08	-0.04988	0.63	-0.0264	-0.0235	0.64751	0.570955967	-0.02	0.00023
17	2013	Q3	0.58	0.70	0.6949325	-0.1186	-0.08	-0.03946	0.66	-0.0121	-0.0273	0.66592	0.586735076	-0.01	0.00011
18	2013	Q4	1.02	0.72	0.7112588	0.31	0.25	0.05	0.76	0.01826	0.03474	0.68432	0.938213824	0.08	0.00639
19	2014	Q1	0.67	0.75	0.733324	-0.07	-0.11	0.04	0.77	0.01181	0.02944	0.70272	0.594012972	0.07	0.00516
20	2014	Q2	0.61	0.75	0.7488936	-0.14	-0.08	-0.06	0.69	0.01472	-0.0735	0.72112	0.644565014	-0.03	0.00096
21	2014	Q3	0.70	0.68	0.7127014	-0.02	-0.08	0.06	0.77	0.03015	0.03158	0.73953	0.660344124	0.03	0.00122
22	2014	Q4	1.02	0.69	0.682293	0.34	0.25	0.09	0.77	-0.007	0.09454	0.75793	1.011822871	0.01	0.00014
23	2015	Q1	0.37	0.61	0.6496831	-0.28	-0.11	-0.17	0.48	-0.0006	-0.1696	0.77633	0.667622019	-0.30	0.08814
24	2015	Q2	0.67	0.71	0.66105	0.00	-0.08	0.08	0.74	-0.1386	0.2195	0.79473	0.718174061	-0.05	0.00279
25	2015	Q3	0.38	0.86	0.7882102	-0.41	-0.08	-0.33	0.46	0.01875	-0.3453	0.81313	0.733953171	-0.35	0.12351
26	2015	Q4	1.43	0.88	0.871623	0.56	0.25	0.30	1.17	0.04913	0.25277	0.83154	1.085431919	0.34	0.11695
27	2016	Q1	0.98	0.96	0.921064	0.06	-0.11	0.17	1.09	0.10483	0.06717	0.84994	0.741231066	0.24	0.05911
28	2016	Q2	0.72	0.95	0.9550208	-0.24	-0.08	-0.16	0.80	-0.0438	-0.1156	0.86834	0.791783109	-0.07	0.00529
29	2016	Q3	0.72	0.95	0.9475881	-0.22	-0.08	-0.14	0.80	-0.0611	-0.083	0.88674	0.807562218	-0.08	0.00692
30	2016	Q4	1.36	1.02	0.9831093	0.37	0.25	0.12	1.10	0.00904	0.11119	0.90515	1.159040966	0.20	0.03928
31	2017	Q1	1.00	1.09	1.0528496	-0.06	-0.11	0.05	1.10	0.06669	-0.0158	0.92355	0.814840113	0.18	0.03248
32	2017	Q2	0.99	0.99	1.0401472	-0.05	-0.08	0.03	1.07	0.07208	-0.0432	0.94195	0.865392156	0.13	0.01616
33	2017	Q3	1.01	0.91	0.9516212	0.06	-0.08	0.14	1.09	-0.0161	0.15247	0.96035	0.881171265	0.13	0.01630
34	2017	Q4	0.97	0.95	0.9307875	0.04	0.25	-0.21	0.72	-0.0891	-0.1245	0.97875	1.232650013	-0.26	0.06839
35	2018	Q1	0.67	0.99	0.9716842	-0.30	-0.11	-0.19	0.78	-0.0574	-0.1326	0.99716	0.88844916	-0.22	0.04644
36	2018	Q2	1.15	0.99	0.9931505	0.15	-0.08	0.23	1.22	0.084	0.14736	1.01556	0.939001203	0.21	0.04366
37	2018	Q3	1.18	1.11	1.0490875	0.13	-0.08	0.21	1.26	0.03	0.17627	1.03396	0.954780312	0.23	0.05098
38	2018	Q4	0.97	1.01	1.0561073	-0.08	0.25	-0.34	0.72			1.05236	1.30625906	-0.34	0.11231
39	2019	Q1	1.12				-0.11		1.23			1.07077	0.962058207	0.16	0.02509
40	2019	Q2	0.76				-0.08		0.83			1.08917	1.01261025	-0.26	0.06554
41	2019	Q3					-0.08					1.10757	1.03	MSE	0.02544

- Model Result

- The predicted EPS for Q3 2019 is \$1.03
- MSE is 0.02544, a better prediction compared with Winter's Method
- Predicted vs. Actual EPS



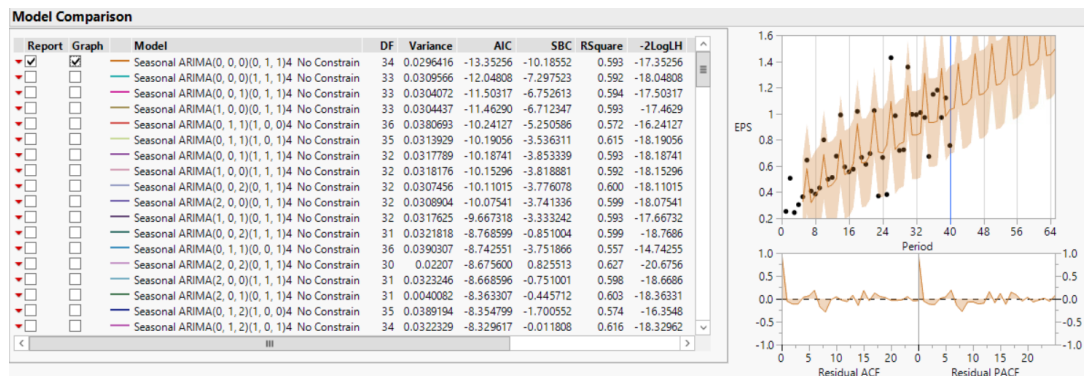
Appendix C: ARIMA Model

- Model

Because there is a seasonality of quarter, we need to take seasonal differencing at lag 4.

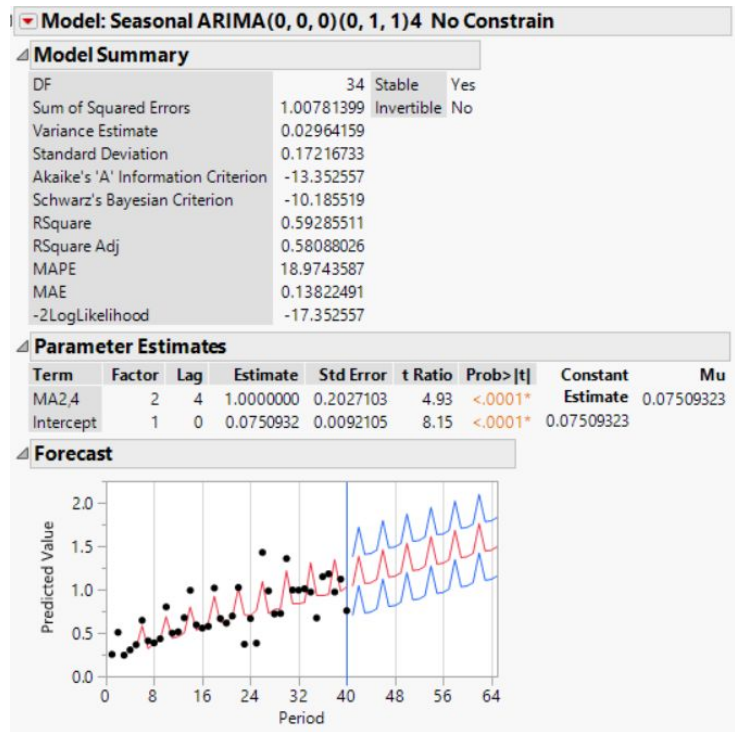
- Model Selection

We adjusted the accuracy measure by the number of parameters using Akaike's Information Criterion (AIC) and/or Bayesian Information Criterion (BIC). We preferred models that have the smallest AIC and BIC. Seasonal ARIMA(0,0,0)(0,1,1)4 has both the lowest AIC and BIC. Therefore, we considered ARIMA(0,0,0)(0,1,1)4 as a candidate before checking model adequacy.



- Model Adequacy Check

We checked the model result for ARIMA(0,0,0)(0,1,1)4. It has an MSE of 0.0296 and an MAPE of 18.97%.



- Predicted Value

Period	Actual EPS	Predicted EPS
31	0.99507	0.8383180695
32	0.992502	0.8370246251
33	1.008831	0.8509781675
34	0.971138875	1.3090584175
35	0.672956	0.9330052925
36	1.147946	0.9315525286
37	1.180561	0.9436106027
38	0.971138875	1.3466050333
39	1.120452	0.9792041583
40	0.756609	1.0306894793
41		1.0423988741

Work Cited

Al-Muslim, A., & Nassauer, S. (2019, May 30). *Dollar-Store Chains Post Stronger Sales, But Tariffs Cloud Outlook*. Retrieved from

<https://www.wsj.com/articles/dollar-store-chains-post-stronger-sales-but-tariffs-cloud-outlook-11559229417>.

Herman, Zach. "State Unemployment Rates: September 2019." *State Unemployment Rates September 2019*, 21 Oct. 2019, www.ncsl.org/research/labor-and-employment/state-unemployment-update.aspx.

Paul Davidson, USA TODAY (2018, October 8). *Dollar Tree, and its customers, feel pain of tariffs on Chinese imports*. Retrieved from

<https://www.usatoday.com/story/money/2018/10/08/china-tariffs-dollar-tree-shoppers-hurt-trump-imports/1498752002/>

Zumbrun, J., Restuccia, A., & Leary, A. (2019, November 8). *Trump Says U.S. Hasn't Yet Agreed to Roll Back Tariffs as Part of China Trade Deal*. Retrieved from

<https://www.wsj.com/articles/trump-says-u-s-hasnt-yet-agreed-to-roll-back-tariffs-as-part-of-china-trade-deal-11573227309>.