

CRTx®

Credit Risk Transfer Return Tracking Index

www.markfontanilla.com/crtx-index

12/31/2019 Index Rebalancing Update

CRTx® Aggregate Index: December Highlights

- **The CRTx® Aggregate Index posted a 0.65% total return in December, and finished 2019 up 6.30% (vs. 2.79% in 2018).** In a year that saw lower rates and rallying credit buoy most financial markets to solid, broad-based gains, CRT finished the year strongly, with the CRTx® up 1.48% in Q4, outperforming most major fixed income indexes over the same period, except for HY benchmarks which showed quarter returns in excess of 2.00%.
- **Within the CRT complex, SUBs outperformed even more in December as the back end of the CRT credit curve flattened, with LMEZZ spreads modestly firming as well.** Seasoned 2015/2016 LMEZZ issue price volatility generally stabilized to end the year, which helped to support aggregate CRT sector performance in Q4. Credit performance continued to be persistently good as 2019 total index write-downs and interest shortfalls contributed less than 2bps of drag on CRTx® Aggregate total returns for the year.
- **CRT overall monthly excess return volatility in December was the lowest of the year, coming in at 0.55%, as YTD volatility closed at 1.64%, slightly lower than the 1.71% from 2018.** Comparatively, broader bond market excess return volatility has run in the 2.25%-2.50% this year, which continues to support current positive CRT risk/return relative value versus other fixed income sectors. Overall CRT correlations to other fixed income sectors remained relatively low, with only moderate correlation seen with HY. Given supply is on a short hiatus for now based on Fannie Mae CAS and FHLMC STACR® issuance calendars, expect spreads to stay calm to start the year.
- **The CRTx® Aggregate index market value declined slightly to \$52.47 billion for the January basket, but is up 7.5% YoY.** December Index paydowns stayed elevated as no new classes entered the Index for the January basket, but 5 M1 classes paid off. The CRTx® Aggregate basket is currently at 228 constituents across 81 deals.

Dec 2019 CRTx® Agg Tot Ret	+65 bps
Price Attribution	+25 bps
Paydown Attribution	-4 bps
Cpn Accr&Pmt Attribution	+44 bps
Excess Return	+51 bps
Volatility (Annualized)	0.55%
UPB Paydown %	2.63%
QTD Total Return	1.48%
YTD Total Return	6.30%

CRTx® Rebalancing For Jan 2020
As of 12/31/2019

January 2020 Aggregate Constituency (w/MoM Δ):

• Beg. UPB (\$B):	\$49.69	-2.6%
• Beg. Market Value (\$B):	\$52.47	-2.3%
• Constituents:	228	-5
• WAvg Constituent Value:	105.59	+0.37 pts
• WAvg Constituent Coupon:	5.35%	+13 bps

Index (+) Entries* & (-) Exits

(-) CAS 2017-C07 2M1
 (-) CAS 2018-C02 2M1
 (-) CAS 2018-C06 1M1
 (-) CAS 2018-R07 1M1
 (-) STACR 2019-DNA2 M1

* 0.00% of Beg. Aggregate Index Market Value

CRTx® Mkt Val Breakdown 1/2020				
Deal Vintage	Aggregate	UMEZZ	LMEZZ	SUB
All	100%	9.0%	71.9%	19.2%
2019	21.2%	2.7%	12.4%	6.1%
2018	20.1%	2.0%	13.5%	4.6%
2017	21.6%	2.1%	15.0%	4.5%
2016	16.0%	0.9%	12.8%	2.2%
2015	10.3%	0.8%	7.9%	1.7%
<=2014	10.8%	0.6%	10.2%	0.0%

12/31/2019 Index Rebalancing Update (continued)

Dec 2019 CRTx® RNI™ Tot Ret	+96 bps
Price Attribution	+58 bps
Paydown Attribution	+0 bps
Cpn Accr&Pmt Attribution	+39 bps
Excess Return	+82 bps
Volatility (Annualized)	1.32%
UPB Paydown %	3.34%
QTD Total Return	1.67%
YTD Total Return	11.37%

CRTx® RNI™ Rebalancing For Jan 2020
As of 12/31/2019

January 2020 Aggregate Constituency (w/MoM Δ):

• Beg. UPB (\$B):	\$10.81	-3.3%
• Beg. Market Value (\$B):	\$11.13	-2.7%
• Constituents:	52	-1
• WAvg Constituent Value:	102.94	+0.7 pts
• WAvg Constituent Coupon:	4.68%	+17 bps

Index (+) Entries* & (-) Exits

(-) STACR 2019-DNA2 M1

* 0.00% of Beg. Aggregate Index Market Value

Deal Vintage	CRTx® RNI™ Mkt Val Breakdown 1/2020			
	Aggregate	UMEZZ	LMEZZ	SUB
All	100%	12.8%	58.5%	28.7%
2019	100.0%	12.8%	58.5%	28.7%
2018	0.0%	0.0%	0.0%	0.0%
2017	0.0%	0.0%	0.0%	0.0%
2016	0.0%	0.0%	0.0%	0.0%
2015	0.0%	0.0%	0.0%	0.0%
<=2014	0.0%	0.0%	0.0%	0.0%

Highlights (continued)

CRTx® RNI™* Agg. Index: December Highlights
 (*Rolling New Issues – 12mth Lookback)

- The CRTx® RNI™ returned 0.96% in December, beating the broad market CRTx® Aggregate by 31bps for the month, and ending a 3-month underperformance streak. For 2019, the CRTx® RNI™ rolling basket returned 11.37%, mostly due to spread tightening in recent issue LMEZZ, and particularly in SUBs. Fundamentally, the current track record for GSE mortgage credit performance has been very good, which is supportive for SUB valuations, and “on-the-run” spreads should hold steady as the market awaits the start of the new issuance calendars.
- The CRTx® RNI™ market value declined 2.7% to \$10.81 billion for the January basket as no constituents rolled off or on, while M1 paydowns stayed elevated in the December factor updates. The Index constituency decreased by one to 52 securities representing 16 deals, as an early-2019 M1 issued paid off, evidence of the recently higher prepayment speeds.
- Within the RNI™ basket, spread and return volatility picked up slightly versus November, mostly based on the recent-issue LMEZZ and SUB rally, but overall newer-issue volatility during Q4 remained on the lower end of the 2019 range. The RNI™ Aggregate and Sub-Indexes held onto their return gains of 2019 versus the beta basket of the CRT® Aggregate, however, for the near term, look for the RNI™’s return outperformance trend to narrow vs. the broader CRTx® Aggregate as sector seasoning and credit curves end the year at the flattest levels of 2019.

CRTx® Index Suite Total Return Performance (as of Month End 12/31/2019)

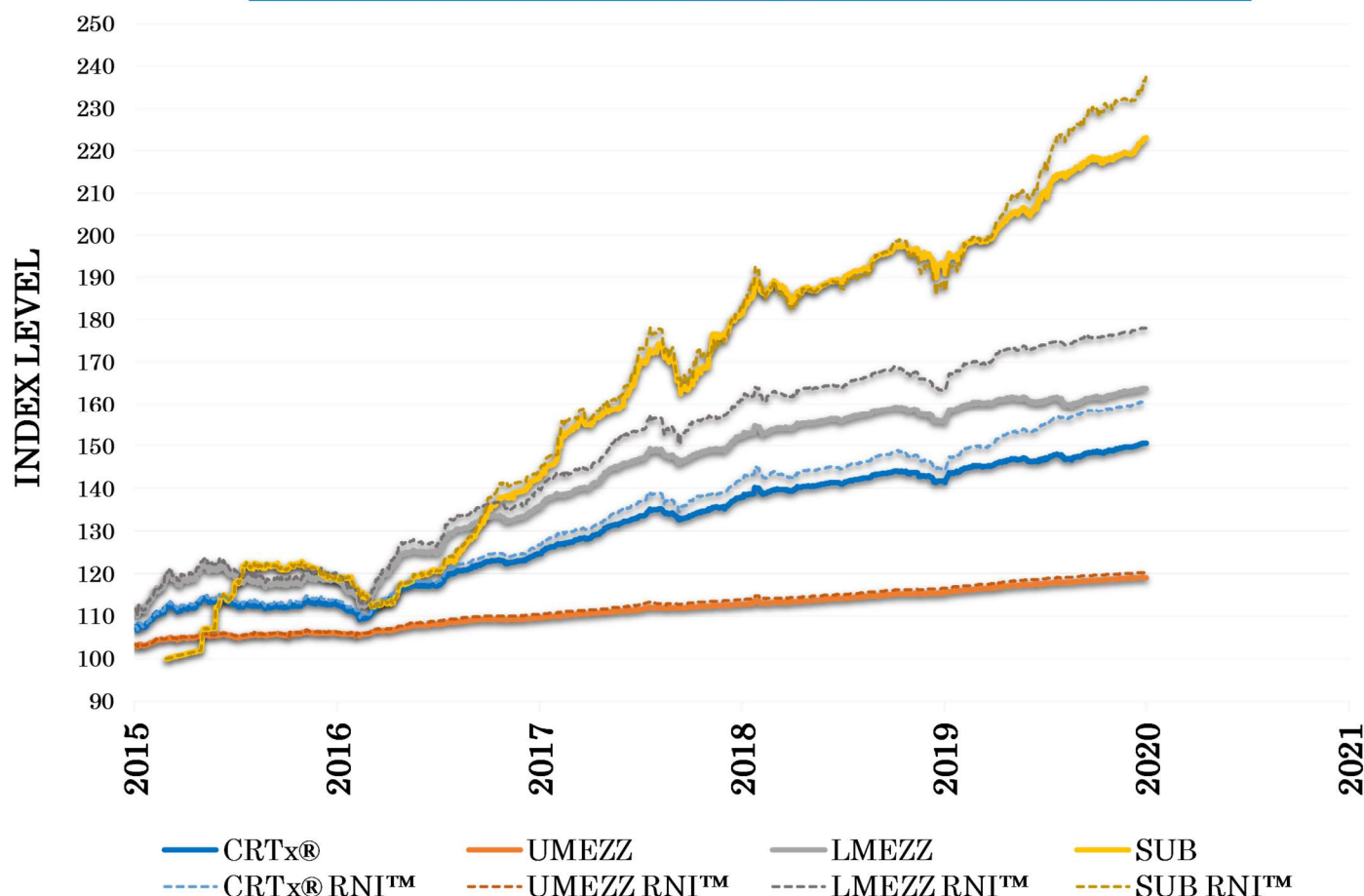
CRTx® (Credit Risk Transfer Return Tracking Index) Return Summary										
RETURNS										
		Period					Annualized			
		Daily	Wkly	Mthly	MTD	QTD	YTD	1-YR	3-YR	As of Date
Aggregate		0.03%	0.08%	0.65%	0.65%	1.48%	6.30%	6.30%	6.52%	12/31/19
	Upper Mezzanine	0.01%	-0.01%	0.20%	0.20%	0.66%	3.25%	3.25%	2.82%	12/31/19
	Lower Mezzanine	0.01%	-0.03%	0.42%	0.42%	1.39%	5.03%	5.03%	6.46%	12/31/19
	Subordinate	0.13%	0.52%	1.79%	1.79%	2.32%	15.37%	15.37%	16.16%	12/31/19
	Upper/Lower Mezz.	0.01%	-0.02%	0.39%	0.39%	1.28%	4.70%	4.70%	5.40%	12/31/19
	Lower Mezz./Sub.	0.04%	0.09%	0.70%	0.70%	1.58%	6.87%	6.87%	7.78%	12/31/19
	CAS	0.01%	-0.04%	0.63%	0.63%	1.33%	6.09%	6.09%	6.50%	12/31/19
	STACR	0.06%	0.24%	0.67%	0.67%	1.67%	6.56%	6.56%	6.54%	12/31/19
	LLTV	0.01%	0.06%	0.66%	0.66%	1.50%	6.15%	6.15%	6.43%	12/31/19
	HLTV	0.07%	0.12%	0.62%	0.62%	1.44%	6.56%	6.56%	6.67%	12/31/19
Upper Mezzanine	2019	0.01%	0.01%	0.17%	0.17%	0.54%	2.77%	-	-	12/31/19
	2018	0.01%	0.03%	0.17%	0.17%	0.58%	3.23%	3.23%	-	12/31/19
	2017	0.01%	0.00%	0.20%	0.20%	0.64%	3.17%	3.17%	-	12/31/19
	2016	0.01%	-0.02%	0.24%	0.24%	0.71%	3.21%	3.21%	2.76%	12/31/19
	2015	0.01%	-0.19%	0.26%	0.26%	0.89%	3.32%	3.32%	2.78%	12/31/19
	<=2014	0.01%	0.00%	0.28%	0.28%	1.17%	3.63%	3.63%	2.73%	12/31/19
Lower Mezzanine	2019	0.01%	0.06%	0.50%	0.50%	1.23%	6.34%	-	-	12/31/19
	2018	0.01%	0.00%	0.60%	0.60%	1.16%	9.02%	9.02%	-	12/31/19
	2017	0.01%	-0.03%	0.39%	0.39%	1.41%	5.99%	5.99%	-	12/31/19
	2016	0.01%	-0.09%	0.54%	0.54%	1.74%	2.13%	2.13%	6.30%	12/31/19
	2015	0.01%	-0.10%	0.13%	0.13%	1.40%	2.70%	2.70%	4.80%	12/31/19
	<=2014	0.01%	-0.02%	0.20%	0.20%	1.30%	3.68%	3.68%	5.55%	12/31/19
Subordinate	2019	0.38%	1.28%	2.36%	2.36%	3.25%	22.84%	-	-	12/31/19
	2018	0.02%	0.08%	1.59%	1.59%	2.52%	21.70%	21.70%	-	12/31/19
	2017	0.02%	0.40%	1.01%	1.01%	1.64%	11.72%	11.72%	-	12/31/19
	2016	0.03%	-0.04%	3.18%	3.18%	1.66%	8.63%	8.63%	16.44%	12/31/19
	2015	0.02%	0.08%	0.60%	0.60%	1.48%	6.65%	6.65%	13.63%	12/31/19
	<=2014									12/31/19

CRTx® RNI™ (Rolling New Issues*) Return Summary										
RETURNS										
		Period					Annualized			
		Daily	Wkly	Mthly	MTD	QTD	YTD	1-YR	3-YR	As of Date
Aggregate		0.11%	0.39%	0.96%	0.96%	1.67%	11.37%	11.37%	8.34%	12/31/19
	Upper Mezzanine	0.01%	0.01%	0.17%	0.17%	0.55%	3.20%	3.20%	2.89%	12/31/19
	Lower Mezzanine	0.01%	0.06%	0.50%	0.50%	1.20%	9.05%	9.05%	8.36%	12/31/19
	Subordinate	0.38%	1.28%	2.36%	2.36%	3.33%	25.59%	25.59%	18.14%	12/31/19
	LLTV	0.00%	0.48%	1.16%	1.16%	1.73%	10.81%	10.81%	7.96%	12/31/19
	HLTV	0.23%	0.28%	0.74%	0.74%	1.61%	12.37%	12.37%	8.96%	12/31/19

* Most recently issued securities within a "rolling" 12-month window

CRTx® / CRTx® RNI™ Historical Index Values Comparison (as of Month End 12/31/2019)

CRTx® RNI™ (Rolling New Issues) vs. CRTx® Index Values

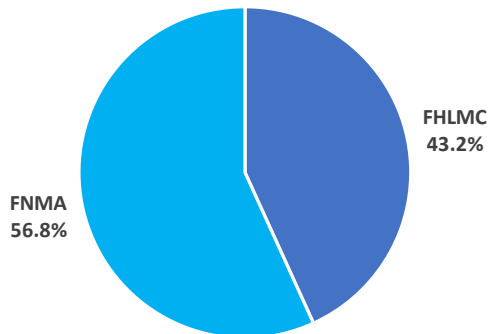


* CRTx® Aggregate Index and Sub Index Constituency

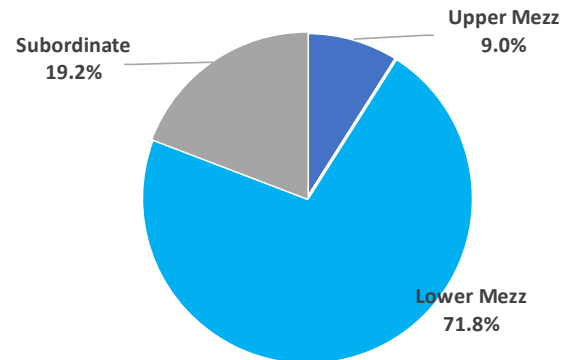
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CRTx® Select Constituent Metrics (as of January 2020 Starting Constituency)

Sponsor % of CRTx® Mkt Val For 01/2020



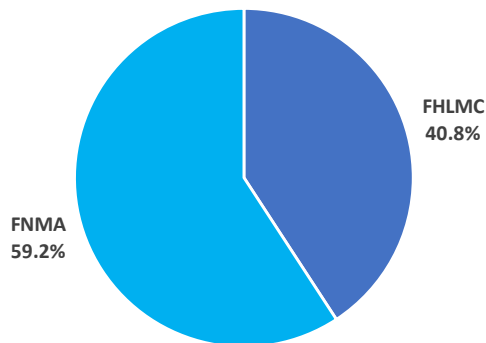
Sub Index % of CRTx® Mkt Val For 01/2020



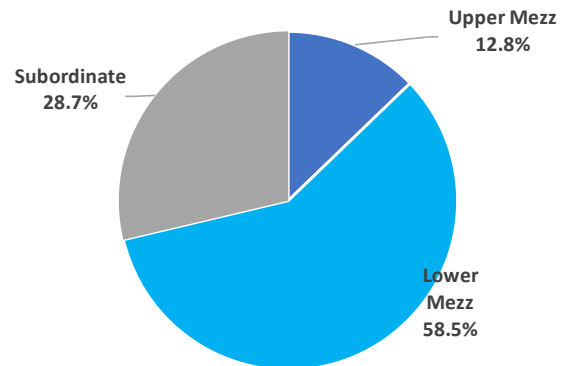
CRTx® Valuation Month	Month End Total Return	Beginning Constituents	Starting UPB	Starting Market Value	Starting Wtd Px + Accr	Starting WAvg Cpn	Starting WAvg Cpn Margin
Jan-2017	1.73%	136	30,635,543,863	32,096,125,632	104.77	4.70	395
Feb-2017	0.44%	136	31,409,187,966	33,308,962,720	106.05	4.72	395
Mar-2017	0.69%	144	32,517,186,276	34,429,213,421	105.88	4.71	393
Apr-2017	1.80%	145	33,534,111,196	35,567,760,320	106.06	4.90	392
May-2017	1.18%	148	34,545,143,500	37,102,973,962	107.40	4.89	390
Jun-2017	1.08%	154	36,559,901,193	39,445,598,983	107.89	4.85	383
Jul-2017	1.13%	154	36,960,548,292	40,125,896,076	108.56	5.03	382
Aug-2017	-0.85%	157	37,868,711,578	41,338,889,729	109.16	5.01	377
Sep-2017	-0.26%	161	38,450,544,875	41,413,057,902	107.70	4.99	376
Oct-2017	0.93%	161	37,965,303,718	40,653,923,485	107.08	5.02	378
Nov-2017	0.33%	164	39,280,202,943	42,203,767,792	107.44	4.97	373
Dec-2017	1.96%	168	39,956,637,967	42,844,604,733	107.23	5.03	370
Jan-2018	1.54%	164	39,474,798,661	43,041,080,732	109.03	5.27	372
Feb-2018	-0.26%	167	39,939,512,665	43,994,471,289	110.15	5.25	369
Mar-2018	-0.21%	169	41,017,066,226	44,799,231,631	109.22	5.26	364
Apr-2018	0.85%	173	42,628,557,312	46,147,934,241	108.26	5.46	359
May-2018	0.34%	171	42,241,567,665	45,959,484,313	108.80	5.49	360
Jun-2018	0.10%	174	42,864,967,271	46,548,011,728	108.59	5.53	357
Jul-2018	0.71%	175	43,499,746,985	47,020,352,767	108.09	5.64	355
Aug-2018	0.67%	178	43,951,183,222	47,607,311,601	108.32	5.60	354
Sep-2018	0.49%	181	44,461,531,990	48,228,311,665	108.47	5.59	353
Oct-2018	-0.28%	184	44,818,307,961	48,627,472,412	108.50	5.74	353
Nov-2018	-0.38%	194	46,292,107,661	49,742,058,694	107.45	5.79	351
Dec-2018	-0.79%	196	46,818,174,805	49,837,570,835	106.45	5.82	350
Jan-2019	1.82%	194	46,413,757,739	48,813,599,349	105.17	6.02	351
Feb-2019	0.67%	197	46,772,850,585	49,835,261,884	106.55	6.03	352
Mar-2019	0.02%	203	48,032,924,530	51,194,424,387	106.58	6.00	351
Apr-2019	1.01%	207	49,316,494,813	52,277,031,986	106.00	5.98	349
May-2019	-0.19%	209	49,790,890,759	53,037,404,665	106.52	5.95	348
Jun-2019	0.27%	213	49,953,468,597	52,833,120,553	105.76	5.92	349
Jul-2019	0.64%	209	49,366,797,803	52,160,276,911	105.66	5.91	350
Aug-2019	-0.22%	216	50,468,731,712	53,381,992,659	105.77	5.76	349
Sep-2019	0.65%	219	50,665,720,866	53,218,677,450	105.04	5.63	349
Oct-2019	0.34%	222	50,254,380,617	52,920,221,300	105.30	5.53	351
Nov-2019	0.48%	228	50,975,909,280	53,606,190,708	105.16	5.33	351
Dec-2019	0.65%	233	51,029,160,871	53,690,414,024	105.22	5.22	352
Jan-2020		228	49,686,844,416	52,466,578,192	105.59	5.35	356

CRTx® RNI™ Select Constituent Metrics (as of January 2020 Starting Constituency)

Sponsor % of CRTx® RNI™ Mkt Val For 01/2020



Sub Index % of CRTx® RNI™ Mkt Val For 01/2020



CRTx® RNI™ Valuation Month	Month End Total Return	Beginning Constituents	Starting UPB	Starting Market Value	Starting Wtd Px + Accr	Starting WAvg Cpn	Starting WAvg Cpn Margin
Jan-2017	1.84%	58	12,640,805,888	13,275,175,101	105.02	4.95	420
Feb-2017	0.54%	57	12,964,446,131	13,718,268,210	105.81	4.89	412
Mar-2017	0.52%	60	13,538,376,545	14,193,918,058	104.84	4.67	389
Apr-2017	1.67%	56	13,408,970,243	13,924,618,857	103.85	4.63	365
May-2017	2.09%	54	13,571,982,822	14,153,849,534	104.29	4.45	346
Jun-2017	1.08%	56	15,068,979,065	15,855,345,378	105.22	4.32	330
Jul-2017	1.36%	51	14,504,592,829	15,285,644,193	105.38	4.43	322
Aug-2017	-1.32%	51	14,498,803,898	15,314,365,896	105.63	4.28	305
Sep-2017	0.17%	54	14,355,888,908	14,818,046,329	103.22	4.14	290
Oct-2017	1.04%	46	13,111,219,325	13,494,197,620	102.92	4.15	291
Nov-2017	0.44%	48	14,393,547,162	14,862,545,426	103.26	4.09	285
Dec-2017	2.15%	51	14,481,730,157	14,878,810,812	102.74	4.09	276
Jan-2018	1.86%	48	13,759,885,957	14,367,377,384	104.41	4.26	271
Feb-2018	-0.52%	48	13,318,377,910	14,033,661,986	105.37	4.17	260
Mar-2018	-0.99%	43	13,241,940,466	13,755,399,805	103.88	4.10	248
Apr-2018	1.17%	46	13,884,239,740	14,126,640,355	101.75	4.23	236
May-2018	0.34%	42	12,545,340,421	12,814,841,641	102.15	4.18	229
Jun-2018	-0.14%	39	11,337,757,334	11,505,111,564	101.48	4.16	220
Jul-2018	0.90%	39	11,577,947,012	11,661,871,155	100.72	4.25	216
Aug-2018	1.08%	39	11,253,518,724	11,383,174,288	101.15	4.26	220
Sep-2018	0.61%	36	11,217,440,268	11,400,528,723	101.63	4.25	219
Oct-2018	-0.75%	40	12,003,066,631	12,221,099,442	101.82	4.44	223
Nov-2018	-0.59%	44	12,140,069,625	12,155,219,472	100.12	4.58	230
Dec-2018	-1.12%	41	11,905,003,810	11,780,986,539	98.96	4.63	232
Jan-2019	2.67%	41	11,878,828,384	11,576,357,066	97.45	4.82	231
Feb-2019	0.96%	42	11,690,163,411	11,668,711,493	99.82	4.94	243
Mar-2019	0.24%	46	11,805,116,972	11,843,264,036	100.32	5.05	256
Apr-2019	1.93%	47	11,496,051,271	11,521,401,714	100.22	5.12	263
May-2019	-0.01%	50	12,325,563,537	12,533,604,780	101.69	5.10	262
Jun-2019	1.10%	51	11,881,379,851	12,033,434,980	101.28	5.14	271
Jul-2019	1.19%	48	10,813,358,090	11,041,172,540	102.11	5.21	280
Aug-2019	0.49%	52	11,648,252,778	11,964,569,893	102.72	5.10	283
Sep-2019	0.62%	52	11,555,452,802	11,866,682,740	102.69	4.99	284
Oct-2019	0.25%	52	11,145,361,078	11,471,457,452	102.93	4.90	288
Nov-2019	0.45%	49	10,957,162,877	11,213,504,874	102.34	4.63	280
Dec-2019	0.96%	53	11,183,706,619	11,434,402,160	102.24	4.51	280
Jan-2020		52	10,810,525,676	11,128,255,837	102.94	4.68	289

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