Exhibit 18

to the Declaration of Kurt M. Gosselin in Support of
Wells Fargo Bank, N.A.'s Motions to Exclude the Opinions of
Plaintiffs' Proferred Experts (Mar. 13, 2020) in
Commerzbank AG v. Wells Fargo Bank, N.A., Case No. 15-cv-10033-KPF-SN, and
Phoenix Light SF Ltd., et al. v. Wells Fargo Bank, N.A., No. 14-cv-10102-KPF-SN (S.D.N.Y.)

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

COMMERZBANK AG, Plaintiff, v. WELLS FARGO BANK, N.A., Defendant.	:	Index No. 15-cv-10033

SURREPLY OF ETHAN COHEN-COLE, PH.D.

HIGHLY CONFIDENTIAL

MARCH 10, 2020

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I. INTRODUCTION AND SCOPE OF WORK

A. Qualifications

1. I am a Senior Advisor at Vega Economics, a company that provides consulting services on various economic issues. I hold a Ph.D. and M.A. in Economics from the University of Wisconsin at Madison, an M.P.A. in Public Policy from Princeton University, and a B.A. in History from Harvard University.

2. For my work on this matter, Vega Economics is being compensated on my behalf at a rate of $875/hour. In performing my analyses, I utilized a team of Vega Economics personnel who worked under my supervision and direction at rates of $275 to $750. Neither my compensation nor that of Vega Economics is contingent upon my findings or the outcome of this matter. I reserve the right to express additional opinions or otherwise supplement my analyses or the opinions expressed herein. All of the opinions included herein are stated to a reasonable degree of professional certainty.

B. Case Background and Assignment

3. Commerzbank AG ("Plaintiff") brought this action against Wells Fargo Bank, N.A. ("Wells Fargo") for alleged breaches of contractual and statutory duties in its role as trustee of 15 RMBS trusts ("Relevant Trusts").[1, 2] In support of their claims, Plaintiff submitted an amended expert report by Dr. Karl N. Snow on December 12, 2018. In his report, Dr. Snow purported to calculate "damages to the Plaintiff resulting from the contended failure of Wells Fargo to

[1] Complaint. *Commerzbank AG v. Wells Fargo Bank, N.A.* (S.D.N.Y. No. 1:15-cv-10033) (Dec. 24, 2015) ("Complaint") at preface, ¶¶ 1, 16-21.

[2] The Relevant Trusts are: ABFC Asset-Backed Certificates, Series 2005-HE2 ("ABFC 2005-HE2"); ABFC Asset-Backed Certificates, Series 2005-OPT1 ("ABFC 2005-OPT1"); ABFC Asset-Backed Certificates, Series 2006-OPT1 ("ABFC 2006-OPT1"); ABFC Asset-Backed Certificates, Series 2006-OPT2 ("ABFC 2006-OPT2"); Asset Backed Securities Corporation Home Equity Loan Trust, Series WMC 2005-HE5 ("ABSHE 2005-HE5"); Citigroup Mortgage Loan Trust, Series 2005-OPT4 ("CMLTI 2005-OPT4"); Greenpoint Mortgage Funding Trust 2005-AR4 ("GPMF 2005-AR4"); Greenpoint Mortgage Funding Trust 2006-AR1 ("GPMF 2006-AR1"); Greenpoint Mortgage Funding Trust 2006-AR2 ("GPMF 2006-AR2"); Greenpoint Mortgage Funding Trust 2006-AR3 ("GPMF 2006-AR3"); Morgan Stanley ABS Capital I Inc. Trust 2005-WMC2 ("MSAC 2005-WMC2"); Morgan Stanley ABS Capital I Inc. Trust 2005-WMC3 ("MSAC 2005-WMC3"); Morgan Stanley ABS Capital I Inc. Trust 2005-WMC5 ("MSAC 2005-WMC5"); Morgan Stanley Capital I Inc. Trust 2006-HE1 ("MSAC 2006-HE1"); and Option One Mortgage Loan Trust 2006-2 ("OOMLT 2006-2"). Snow, Karl N. Amended Expert Report of Karl N. Snow, PhD. *Commerzbank AG v. Wells Fargo Bank, N.A.* (S.D.N.Y. No. 1:15-cv-10033) (Dec. 12, 2018) and supporting materials ("Snow Report") at Fig. 2. Although the Complaint references a total of 19 trusts, the Snow Report does not address four trusts referenced in the Complaint. *See* Complaint at Exhibit A and Snow Report at ¶ 9 n. 1. Those trusts are: Banc of America Funding 2005-C Trust; Banc of America Mortgage 2006-B Trust; HarborView Mortgage Loan Trust 2007-3; and Mastr Asset Backed Securities Trust 2007-NCW.

enforce or otherwise effectuate (e.g., by providing notice) the Responsible Parties' obligation to repurchase particular loans ('Repurchase Damages')."[3]

4. In his damages calculations, Dr. Snow used two main scenarios, referred to as the "Held-to-Maturity Scenario" and the "Sold Scenario."[4] In the Held-to-Maturity Scenario, Dr. Snow hypothesized a but-for world wherein Commerzbank would not have sold 21 of the 24 at-issue certificates—as they did in the real world—but instead would have elected to hold them through certificate maturity.[5] Alternatively, in the Sold Scenario, Dr. Snow assumed that in the but-for world Commerzbank would still have sold the at-issue certificates but would have received different (and mostly increased) prices ("But-For Prices") from what they actually received.[6]

5. On July 25, 2019, I submitted my rebuttal report to the Snow Report.[7] In that rebuttal report, along with identifying many other errors and shortcomings of the Snow Report, I opined that Dr. Snow's pricing calculations in the Sold Scenario were unreliable for at least two reasons.[8] First, the historical pricing data from Bloomberg that underlies Dr. Snow's regression model is not comprehensive and fails to accurately reflect actual transaction prices.[9] Second, pricing data from Bloomberg are unavailable for many periods Dr. Snow considers in his regression, and the methodology Dr. Snow uses to attempt to adjust for missing data is unjustified.[10] As a result, the But-For Prices Dr. Snow calculates in the Sold Scenario are unreliable and therefore his Repurchase Damages calculation in the Sold Scenario is correspondingly unreliable.

6. On September 30, 2019, Dr. Snow submitted a revised reply to the Cohen-Cole Report.[11] In it, Dr. Snow rejected my criticisms of his bond pricing model and the pricing data on which it relies. Dr. Snow defended his use of historical Bloomberg pricing data and denied that it was

[3] Snow Report at ¶ 14.

[4] *Id*. at ¶ 20.

[5] *Id*. at § IV.A.2.a.

[6] *Id*. at § IV.A.2.b.

[7] Cohen-Cole, Ethan, Expert Report of Ethan Cohen-Cole, PhD. *Commerzbank AG v. Wells Fargo Bank, N.A.* (S.D.N.Y. No. 1:15-cv-10033) (July 25, 2019) ("Cohen-Cole Report").

[8] *Id*. at § VIII.C.

[9] *Id*. at ¶¶ 192-193.

[10] *Id*. at ¶¶ 194-5 and Exhibit 27.

[11] Snow, Karl N., Revised Expert Reply Report of Karl N. Snow, PhD. *Commerzbank AG v. Wells Fargo Bank, N.A.* (S.D.N.Y. No. 1:15-cv-10033) (Sept. 30, 2019, as corrected February 14, 2020) ("Snow Reply").

deficient or incomplete.[12] Dr. Snow included Figure 17 that claimed to be a comparison of missing Bloomberg pricing data between Exhibit 27 to the Cohen-Cole Report and his own analysis.

7. Dr. Snow was deposed in this case on October 24, 2019. During and after the deposition, I understand that a dispute arose about the sufficiency of Dr. Snow's testimony related to his bond pricing model and the pricing data on which it relies.[13] Dr. Snow subsequently amended Figure 17 in his Reply Report on November 20, 2019 ("Amended Figure 17"), and served a corrected version of his Reply Report on February 14, 2020.

8. I have been retained by Wells Fargo, through its counsel Jones Day, to respond to certain aspects of Dr. Snow's defense of his bond pricing model set forth in the Snow Reply. I specifically address and rebut Dr. Snow's claims that (1) the historical Bloomberg data as reported in Amended Figure 17 and used in his model are reliable, and (2) applying the Heckman correction to address missing data yields little change to his results.

II. AMENDED FIGURE 17 EXPOSES HOW MISSING BLOOMBERG PRICING DATA RENDER DR. SNOW'S BUT-FOR PRICES UNRELIABLE.

9. In the Snow Report, Dr. Snow purported to calculate the price that would have prevailed had Wells Fargo fulfilled its alleged obligations for 21 of the at-issue certificates that were sold by Plaintiff ("Sold Certificates"). In order to calculate the price Commerzbank would have received in the but-for world of the Sold Scenario, Dr. Snow constructed a regression model to estimate the relationship among: (1) the prices of the Sold Certificates, as estimated by Bloomberg,[14] on one hand, and on the other hand, (2) trust- and certificate-level characteristics that Dr. Snow claims capture the performance of the loans and the distributions made under the applicable waterfalls; (3) the ABX index that corresponds to the origination date and the credit rating of the certificate at origination; and (4) certificate fixed effects.[15] Having estimated these

[12] *Id*. at § VI.B.1.

[13] *See* Letter from Rebekah B. Kcehowski to Ryan Kane, *Re: Commerzbank AG v. Wells Fargo Bank, N.A., Case No. 15-cv-10033* (Nov. 5, 2019); Letter from Ryan Kane to Rebekah B. Kcehowski, *Re: Commerzbank AG v. Wells Fargo Bank, N.A., Case No. 15-cv-10033* (Nov. 11, 2019); Letter from Rebekah B. Kcehowski to Ryan Kane, *Re: Commerzbank AG v. Wells Fargo Bank, N.A., Case No. 15-cv-10033* (Nov. 15, 2019); and Letter from Ryan Kane to Rebekah B. Kcehowski, *Re: Commerzbank AG v. Wells Fargo Bank, N.A., Case No. 15-cv-10033* (Nov. 20, 2019).

[14] Bloomberg pricing data are referred to as "BVAL pricing data." According to Bloomberg, its BVAL prices are derived using algorithms. *See* Snow Reply at ¶ 113. *See also* Cohen-Cole Report at ¶ 192.

[15] Snow Report at Appendix E ¶¶ 59-61 and supporting materials.

relationships, Dr. Snow used them to predict two prices for each certificate for the month the certificate was actually sold: the "Predicted But-For Price" and the "Predicted Price."[16] He multiplies the ratio of the two by the price at which Plaintiff actually sold the certificate in order to obtain his final But-For Price for each certificate.[17] Dr. Snow's Sold Scenario damages then include the But-For Sales proceeds which are based on this But-For Price.

10. I opined in the Cohen-Cole Report that the majority of historical Bloomberg pricing data used by Dr. Snow was missing and thus his calculations are unreliable.[18] In the Snow Reply, Dr. Snow disagreed with my assessment, contending that, according to his calculations, "only 9% of months in the data are missing BVAL pricing data on one or more trading days."[19] But how Dr. Snow calculated this percentage of missing months was unclear, as original Figure 17 in the Snow Reply incorrectly represented that Dr. Snow had used longer time periods than he actually used for this calculation, including the time period "between certificate purchase and sale dates."[20] Dr. Snow was unable to answer questions about the missing data at his deposition.[21] As the new information in Dr. Snow's Amended Figure 17, served on November 20, 2019, makes clear, Dr. Snow's calculations ignore many months and years during which the relevant data was missing.

A. Dr. Snow's Calculation of Missing Data in Amended Figure 17 Relies upon a Misleading and Unjustified Truncation of the Relevant Time Period.

11. In Amended Figure 17 of the Snow Reply, Dr. Snow makes clear for the first time how he truncates the time period used in his calculations, leading him to undercount the number of

[16] *Id*. at ¶ 62.

[17] *Id*. at ¶ 63.

[18] Cohen-Cole Report at § VIII.C.

[19] Snow Reply at ¶ 115.

[20] *Id*. In fact, the description was so misleading that it confused Dr. Snow. *See* Karl N. Snow Dep. Tr. (Oct. 24, 2019) at 355:5-17 (agreeing the column header says that the last two columns are counting months of missing data from the purchase date of the certificate to the sales date); 355:23-356:11 (confused at representation that the columns contain data beginning at some time other than purchase date); 357:6-12 (admitting that the original heading would be incorrect if it did not include percentages of missing Bloomberg pricing data from the certificate purchase date).

[21] *Id.* at 353:8 (he would "have to double check" if he had prices for a certain certificate for the dates); 353:21-22 ("I would have to check to see when exactly the data began. I don't recall offhand."); 354:8-13 (stating he would "have to double check" if he was accurately counting the months for his analysis in Figure 17); 354:15-23 (admitting he could not testify one way or the other what date range he was using in calculating the missing Bloomberg data percentage of months in Figure 17); 356:13-20 ("I would have to verify that, you know. I can't tell you. I am not looking at the data.").

months for which BVAL pricing data is missing. Specifically, in his analysis of missing data, Dr. Snow only counts missing observations *after* the first non-missing data point and *before* the last non-missing data point. In other words, Dr. Snow simply narrows the time period, ignoring preceding and subsequent months for which the data is missing. Unsurprisingly, by excluding months with missing data from his calculations, Dr. Snow undercounts the actual amount of missing data. His calculations are, therefore, misleading.

12. For example, in response to my critique that the historical pricing data for ABFC 2005-HE2 M6 is missing for more than 85% of the relevant months, Dr. Snow states that "Bloomberg reports prices for this certificate on every trading day beginning on January 28, 2010 through the date upon which the certificate was paid off."[22] Dr. Snow therefore concludes that 0% of the pricing data are missing for this certificate.[23] In so doing, Dr. Snow simply ignores the fact that Bloomberg is missing pricing data for this certificate for the 53 months between August 30, 2005 (the trust closing date) and January 28, 2010, as well as the 84 months between November 25, 2011 and November 7, 2018 (the last date for which data was apparently available to Dr. Snow).[24, 25] *See* **Appendix A**: *Missing Bloomberg Pricing Data From Trust Closing to "Present."*

13. Using the full record of Bloomberg pricing data for ABFC 2005-HE2 M6 since the trust closed supports my calculation. The pricing data is missing for 137 months and non-missing for 23 months; therefore 85% of the months are missing pricing data.[26] Similarly, using the full record of Bloomberg pricing data between certificate purchase and sale dates, there are 53 months with missing data[27] and 23 months with non-missing data. Therefore, 70% of the months during this time period are missing pricing data.[28]

[22] *Id*. at ¶ 114.

[23] *Id*. at Amended Fig. 17.

[24] November 7, 2018 is the last date appearing in Dr. Snow's historical pricing data.

[25] As Dr. Snow claims, the historical pricing data are non-missing for the twenty-three months from January 28, 2010 to November 25, 2011.

[26] 137 / (137 + 23) * 100% = 85%.

[27] Bloomberg pricing data are missing for this certificate for the 53 months between August 30, 2005 and January 28, 2010.

[28] 53 / (53 + 23) * 100% = 70%.

14. In Amended Figure 17, Dr. Snow would have it believed that because there is no missing data between the first date on which pricing data are available and the last date on which pricing data are available, the historical pricing data are reliable. But that is like zooming in on a broken window far enough that none of the cracks are visible. Dr. Snow provides no justification for ignoring many months from the relevant time period. As a result of this unfounded decision, Dr. Snow's calculations in Amended Figure 17 regarding the rate of missing pricing data drastically undercount the true severity of missing data problems in his bond price regression.

15. As Amended Figure 17 makes clear, the extent to which the data are missing renders Dr. Snow's analysis unreliable. Dr. Snow does not tie the date ranges he used for his price regressions to Plaintiff's purchase or sale of the certificates or to any other relevant facts or dates. They are effectively arbitrary time periods. The conclusions Dr. Snow draws from his limited and arbitrary dataset, including both his But-For Prices and the Sold Scenario damages that depend on those unreliable But-For Prices, are correspondingly unreliable.

B. Through Amended Figure 17, Dr. Snow Admits that His Pricing Data Is Severely Deficient for Three At-Issue Certificates but Does Not Explain Why It Is Appropriate to Apply His Model to These Certificates.

16. Amended Figure 17 provides new information about Dr. Snow's calculation of "missing data" for certain certificates in a footnote that was not included in the original Figure 17. It reads:

> Any dates after the principal balance of a certificate has been paid off are excluded from my calculations. For GPMF 2005-AR4 2A2, GPMF 2006-AR1 A2A, GPMF 2006-AR2 3A3, and GPMF 2006-AR3 4A2, I count from August 6, 2010, July 12, 2017, May 16, 2011, and January 7, 2013, respectively. Lastly, an "n.a." indicates that BVAL data are unavailable within the specified period.

Dr. Snow uses "n.a." in Amended Figure 17 to indicate that there is no available BVAL pricing data from January 28, 2010 through November 2018 for GPMF 2006-AR1 A3, and that there is no available BVAL pricing data from January 28, 2010 through sale date for GPMF 2006-AR1 A2A, GPMF 2006-AR1 A3, and GPMF 2006-AR3 4A2.

17. As this footnote makes clear, Dr. Snow estimates But-For Prices for three of the at-issue certificates with severely deficient pricing data even though the reliability of the certificate fixed effects component of Dr. Snow's model is compromised by the lack of data. The GPMF

2006-AR1 A3 certificate has no pricing data available from Bloomberg at all. Without data, Dr. Snow instead opted to average the certificate fixed effects of the other GPMF certificates (themselves estimated using incomplete data) and used this average as the certificate fixed effect for GPMF 2006-AR1 A3. For two other at-issue certificates—GPMF 2006-AR1 A2A and GPMF 2006-AR3 4A2—there is no historical pricing data available from Bloomberg for the claimed time period during which Commerzbank held the certificates.[29] Nevertheless, Dr. Snow still estimated But-For Prices for each of these certificates without any explanation about why it was appropriate to do so.

18. Dr. Snow's bond price regression's certificate fixed effects are meant to account for the certificate-specific attributes that may impact price. For example, the certificate fixed effects may reflect a certificate's position in the trust structure, the interest rate or margin to which the certificate is entitled, or the type of loans backing the certificate. Because variables indicating these attributes were not included in Dr. Snow's bond price regression, any price effect due to these or other unchanging attributes would be accounted for in the certificate fixed effects element of his model. However, without pricing data for a certificate, Dr. Snow's model cannot estimate a fixed effect for that certificate. Even if limited pricing data is available, the sparseness of that data can lead to unreliable certificate fixed effects. In other words, Dr. Snow incorrectly uses data from other trusts and tranches, with different characteristics, to try to predict prices for certificates in different trusts and tranches, without explanation of why or how that is appropriate here.

19. Because there was no pricing data available for GPMF 2006-AR1 A3, Dr. Snow could not estimate the relationship between that certificate's BVAL price and his other explanatory variables, including the fixed effect of that certificate. Instead, Dr. Snow opted to predict prices for this certificate using a certificate fixed effect based on the average fixed effects estimated for the other GPMF certificates.

20. Dr. Snow provided no discussion or analysis as to the appropriateness of this technique despite marked differences in the GPMF certificates used. For example, three of the four certificates used to compute this average relate to certificates backed by individual supporting loan groups,

[29] Cohen-Cole Report at Exhibit 27 and Snow Reply at Amended Fig. 17.

while the GPMF 2006-AR1 trust is comprised of only one collateral pool.[30] Further, three of the GPMF certificates are "senior support level one" certificates, whereas the GPMF 2006-AR1 A3 certificate is a "senior support level two" certificate, meaning that it (unlike the certificates whose data are used to derive the average fixed effect coefficient) is subordinate to two other senior certificates in the trust structure.[31] Dr. Snow's ad-hoc method of computing the certificate fixed effect for the GPMF 2006-AR1 A3 certificate ignores these differences and is unsupported.

21. Commerzbank (or Dresdner) held GPMF 2006-AR1 A2A from July 19, 2007 to November 4, 2011, but the Bloomberg historical pricing data for this certificate was missing prior to July 12, 2017. That is, the historical pricing data is missing until more than five and a half years (68 months) after Commerzbank sold the certificate. Similarly, Commerzbank (or Dresdner) held GPMF 2006-AR3 4A2 from July 19, 2007 to November 10, 2011, but the Bloomberg historical pricing data for this certificate was missing prior to January 7, 2013. Thus, for these certificates, there is no pricing data at all during Commerzbank's claimed holding periods.[32] Dr. Snow provides no justification as to the appropriateness of estimating prices based on this data either in the Snow Report or in the Snow Reply.

22. As Amended Figure 17 and its accompanying footnote illuminate, the extent to which data is missing for these three certificates undermines entirely the But-For Prices generated by Dr. Snow's model and the damages Plaintiff claims for these holdings, which total $20.61 million or 24.10% of Dr. Snow's Sold Scenario Repurchase Damages.

[30] Structured Asset Mortgage Investments II Inc., GreenPoint Mortgage Funding Trust 2005-AR4, Prospectus Supplement to Prospectus dated December 20, 2004 (July 27, 2005) (WF_CB_001791062 at WF_CB_001791066); Bear Stearns Asset Backed Securities I LLC, GreenPoint Mortgage Funding Trust 2006-AR1, Prospectus Supplement to Prospectus dated June 24, 2005 (Feb. 27, 2006) (WF_CB_001790263 at WF_CB_001790270); Structured Asset Mortgage Investments II Inc., GreenPoint Mortgage Funding Trust 2006-AR2, Prospectus Supplement to Prospectus dated March 28, 2006 (Mar. 29, 2006) (WF_CB_001238952 at WF_CB_1238959); Structured Asset Mortgage Investments II Inc., GreenPoint Mortgage Funding Trust 2006-AR3, Prospectus Supplement to Prospectus dated March 28, 2006 (Apr. 27, 2006) (WF_CB_001789373 at WF_CB_001789380).

[31] *Id*.

[32] I understand that the parties dispute the relevant holding periods and that Commerzbank acquired the GPMF 2006-AR1 A2A and GPMF 2006-AR3 4A2 certificates by way of merger with Dresdner Bank AG as of May 2009. *See* Complaint at ¶ 16. *See also* Plaintiff's Amended Supplemental Responses and Objections to Interrogatory Nos. 1 and 2 of Defendant Wells Fargo Bank, N.A.'s First Set of Interrogatories to Plaintiff. *Commerzbank AG v. Wells Fargo Bank, N.A.* (S.D.N.Y. No. 1:15-cv-10033) (Aug. 28, 2017) at Exhibit A.

C. My Calculation of Missing Data Captures the Entirety of the Relevant Time Period, from Trust Closing Until the Present.

23. In the Cohen-Cole Report, I calculated the fraction of months for which historical pricing data was unavailable from the closing date of each securitization to the present.[33] This calculation captured the entirety of the time period for which data could have been available. As was accurately reported in the Cohen-Cole Report, the quantity of missing data is so high as to render the data, and thus the pricing model, unreliable.

24. The values below in Table 1 differ slightly (by no more than 0.83%) from Exhibit 27 of the Cohen-Cole Report. This is because Exhibit 27 was based on Dr. Snow's supporting materials for his bond pricing model provided with his initial report. Table 1 takes into account adjustments made by Dr. Snow to his supporting materials in his Reply Report.

[33] The "present" is defined as November 2018. November 2018 was the latest time period available to Dr. Snow before filing his opening report.

Table 1: *Missing Historical Bloomberg Data from Trust Closing to Present*

Trust	Tranche	Percent of Missing Data from Trust Closing to Present
ABFC 2005-HE2	M5	58.13
	M6	85.63
ABFC 2005-OPT1	M4	32.28
	M5	55.06
	M6	74.05
ABFC 2006-OPT1	M1	27.70
	M3	76.35
ABSHE 2005-HE5	M8	74.69
CMLTI 2005-OPT4	M5	44.65
	M6	35.22
GPMF 2005-AR4	2A2	87.58
GPMF 2006-AR1	A2A	88.96
	A3	100.00
GPMF 2006-AR2	3A3	90.85
GPMF 2006-AR3	4A2	53.29
MSAC 2005-WMC2	M4	35.15
MSAC 2005-WMC3	B1	39.88
MSAC 2005-WMC5	B1	36.65
	M6	33.54
MSAC 2006-HE1	A4	30.52
OOMLT 2006-2	2A4	28.67
All certificates		**56.55**

25. If I narrow the time period to the dates between when Commerzbank purchased and when Commerzbank sold each at-issue certificate, the share of missing data is just as substantial.

26. The values below in Table 2 differ from Exhibit 27 of the Cohen-Cole Report by no more than 2.29% for the reasons described *supra*, ¶ 24.

Table 2: *Missing Historical Bloomberg Data from Purchase to Sale Date*

Trust	Tranche	Percent of Missing Data from Purchase to Sale Date
ABFC 2005-HE2	M5	69.74
	M6	69.74
ABFC 2005-OPT1	M4	67.11
	M5	66.23
	M6	68.92
ABFC 2006-OPT1	M1	39.81
	M3	61.19
ABSHE 2005-HE5	M8	67.90
CMLTI 2005-OPT4	M5	69.33
	M6	69.33
GPMF 2005-AR4	2A2	76.81
GPMF 2006-AR1	A2A	100.00
	A3	100.00
GPMF 2006-AR2	3A3	85.51
GPMF 2006-AR3	4A2	100.00
MSAC 2005-WMC2	M4	53.13
MSAC 2005-WMC3	B1	70.51
MSAC 2005-WMC5	B1	70.13
	M6	70.13
MSAC 2006-HE1	A4	66.67
OOMLT 2006-2	2A4	62.90
All certificates		**70.37**

27. The timeframes analyzed in Table 2 above and in the Cohen-Cole Report Exhibit 27 accept as true and are based on the holding periods used by Dr. Snow to calculate damages. These are not the same timeframes included in Dr. Snow's pricing regression or depicted in the Snow Reply at Amended Figure 17. Again, the unexplained and unsupported timeframes used by Dr. Snow in his pricing regression and Amended Figure 17 are much shorter than Commerzbank's holding periods and are merely a function of the available data, not tied to Plaintiff's purchase or sale of the certificates—or any other reasonable basis.

III. DR. SNOW'S IMPLEMENTATION OF THE HECKMAN CORRECTION IS WRONG.

28. In the Cohen-Cole Report, I opined that Dr. Snow's But-For Prices were unreliable because, without justification, he used a process called "listwise deletion" to account for missing data,

and this process is appropriate only when the missing data satisfies a statistical property called Missing Completely at Random ("MCAR").[34] In the Snow Reply, despite erroneously claiming that I conflate "missing data" with an "unbalanced panel," Dr. Snow does not dispute the fact that the missing data may not satisfy the MCAR property.[35] Instead, for the first time in the Snow Reply, he proposes and purports to implement a statistical methodology known as the Heckman correction which he describes as a "commonly used method to address the issue of data potentially not [MCAR]."[36] Because he finds "very little changes" to his results after implementing this so-called Heckman correction, Dr. Snow concludes that his original Sold Scenario damages were conservative.[37]

29. However, Dr. Snow's implementation of the Heckman correction (presented for the first time in the Snow Reply) is in error and cannot be used to support a conclusion that the data he uses is sufficiently complete or robust. As a result, Dr. Snow's conclusion that "very little changes" when using the Heckman correction is unsupported and inaccurate.

30. To implement the Heckman correction, Dr. Snow used the statistical software program Stata. According to the Stata User Manual, the Heckman selection model can be thought of in terms of the "regression equation," or the underlying regression of interest, and a "selection equation," which relates certain independent variables to whether or not the dependent variable is observed.[38] The Stata User Manual further states that the selection equation is "an integral

[34] Cohen-Cole Report at ¶ 196. Listwise deletion is the method used by most statistical software when performing regression analysis whereby any observation missing data on any of the variables of interest is excluded from the regression. *See* Allison, Paul D. "Missing Data." *The SAGE Handbook of Quantitative Methods in Psychology.* Ed. Roger E. Millsap and Alberto Maydeu-Olivares. Thousand Oaks, CA: Sage Publications (2009): 72-89 at 72.

[35] Snow Reply at § VI.B.1.

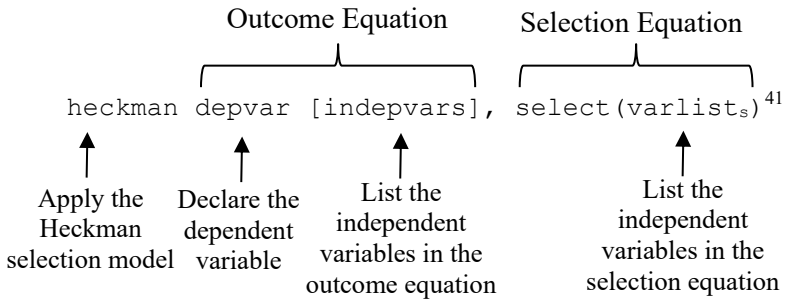
[36] *Id*. at ¶117-8.

[37] *Id*.

[38] StataCorp LLC. "Stata Base Reference Manual: Release 15." Stata Press 986-1002 at 992 ("Stata User Manual"). Note that the Stata User Manual uses the term "Heckman selection model" whereas Dr. Snow uses the term "Heckman correction." I use them interchangeably to refer to the general application of the Heckman model. Note also that the Stata User Manual uses the terms "regression equation" and "outcome equation" interchangeably to refer to the primary regression relationship being estimated. That is, the relationship between the dependent variable with missing observations and the independent variables used to predict that dependent variable.

part of specifying a Heckman [correction] and is required."[39] Dr. Snow has testified that he is aware that the selection equation is a part of the Heckman correction.[40]

31. According to the Stata User Manual, implementing the Heckman correction involves declaring the dependent variable, listing the independent variables to be used to predict the dependent variable in the outcome equation, and listing the independent variables for the selection equation. The specific syntax for the command is:



The syntax allows for two separate lists of independent variables to be used for the outcome and selection equations. The Stata User Manual states that "[t]he selection equation **should contain at least one variable that is not in the outcome equation**."[42] That is, the variables included in "`varlist`$_s$" should include at least one, if not multiple, variables distinct from those variables included in "`indepvars`."

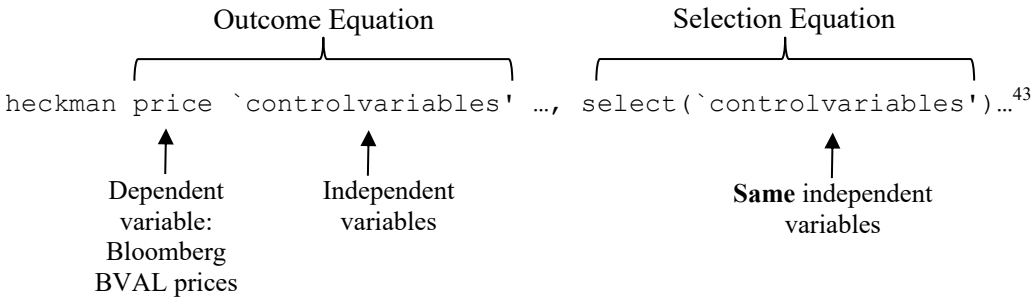
[39] *Id*. at 989.

[40] Snow Dep. 361-2 at 21-17: "Q. Can we look at page 989 of Snow Exhibit 13 [the Stata Reference Manual excerpt]? A. Yes. Q. The bottom provides an equation and it states that – it specifies the variables and options for the selection equation. It is an integral part of specifying a Heckman model and as required the selection equation should contain at least one variable that is not in the outcome equation. Do you see that? A. I do. Q. Do you agree? A. I agree that is what it says and yes, that is part of the Heckman analysis. Q. Do you agree that the selection equation is an integral part of specifying a Heckman model? A. It is part of the process, yes."

[41] Stata User Manual at 989.

[42] *Id*. (emphasis added).

32. In his implementation of the Heckman correction, Dr. Snow ignores this requirement and instead uses an identical list of variables for both the selection equation and the outcome equation. In particular, Dr. Snow's implementation of the Heckman correction specifies the following line of code:



As indicated in this line of code, Dr. Snow applies the Heckman selection model to establish the relationship between BVAL prices and the independent variables included in his model, the "control variables."[44] However, the list of variables used in the outcome and selection equations are identical, contradicting the guidelines set forth in the Stata User Manual.

33. Despite Dr. Snow's testimony that the Stata User Manual is an acceptable reference for using Stata,[45] he could not explain the discrepancy between the Stata User Manual's requirement and his own implementation. Instead, he testified that he had "not thought about that particular issue in the context of what [he had] done."[46] Although Commerzbank has claimed, without any citations, that Dr. Snow implemented the Heckman correction according to the economic literature,[47] in my experience as an econometrician, it is industry practice to include at least one

[43] Snow Reply at Supporting Materials, "09 Regression w. Heckman correction.do" at line 54.

[44] The coding convention of enclosing a word in single quotes (`') refers to a local variable, which relates the word enclosed in quotes to any number of other words, numbers, or equations. In this case, `controlvariables' refers to the independent variables described in Snow Report at Appendix E ¶¶ 59-61.

[45] Snow Dep. 361 at 2-6: "Q. The Stata Reference Manual is something that is frequently used in using the Stata program, right? A. Well, it is – I would say it is something that is referenced in using Stata."

[46] Snow Dep. 362-3 at 25-12: "Q. Do you have any reason sitting here today to disagree with the Stata Reference Manual as it states that the selection equation should contain at least one variable that is not in the outcome equation? A. The only reason I am not going to give you a yes or no answer is I have not thought about that particular issue in the context of what I have done. And I would want to think about it especially since this is a complicated econometric issue."

[47] *See* Letter from Ryan Kane to Rebekah B. Kcehowski, *Re: Commerzbank AG v. Wells Fargo Bank, N.A., Case No. 15-cv-10033* (Nov. 20, 2019).

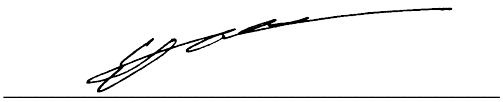
variable in the selection equation that is not in the outcome equation in order to avoid econometric issues involving multicollinearity and identification.[48]

34. As Dr. Snow does not implement the Heckman correction methodology according to what econometricians and the Stata User Manual understand is required, his conclusion that "very little changes" after using the Heckman correction is without basis. Dr. Snow concludes that there are "very little changes" after using the Heckman correction simply because he uses no new variables in the outcome equation, not because there are, in fact, no such changes.

IV. CONCLUSION

35. Accordingly, as explained here and in my rebuttal report, due to his reliance on incomplete Bloomberg pricing data and his failure to properly implement the Heckman correction, Dr. Snow's estimated prices for the Sold Certificates are unreliable and, in turn, so are his Repurchase Damages in the Sold Scenario.

Dated: March 10, 2020



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[48] Cameron and Trivedi, for example, suggest that if exactly the same regressors are used, the model is close to unidentified and multicollinearity problems may arise. Cameron, A. Colin and Pravin K. Trivedi. *Microeconometrics: Methods and Applications*. New York: Cambridge University Press (2005) at 551.

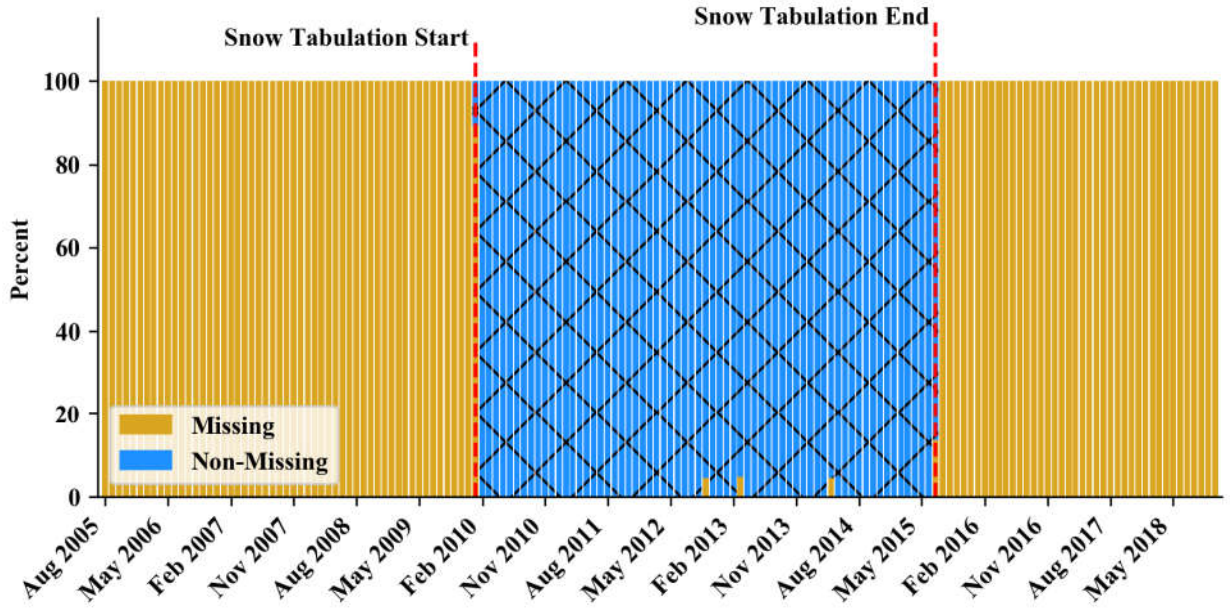
Appendix A

Missing Bloomberg Pricing Data From Trust Closing to "Present"

Missing Bloomberg Pricing Data from Trust Closing to "Present"[1, 2]

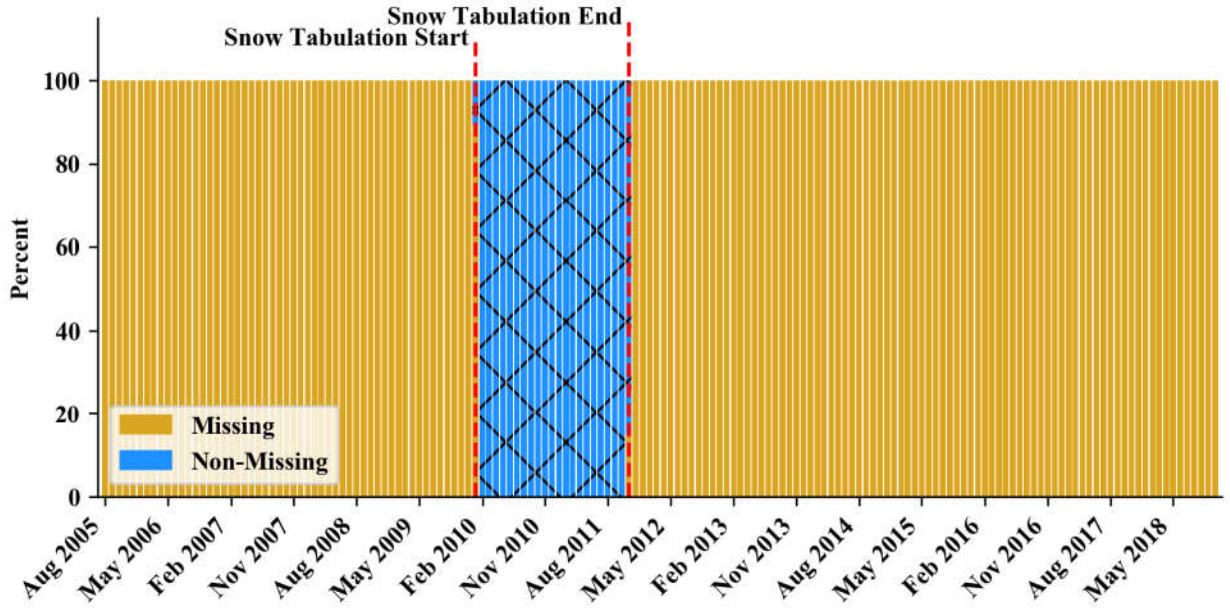
ABFC 2005-HE2 M5

Percent of missing data: 58.13%



ABFC 2005-HE2 M6

Percent of missing data: 85.63%

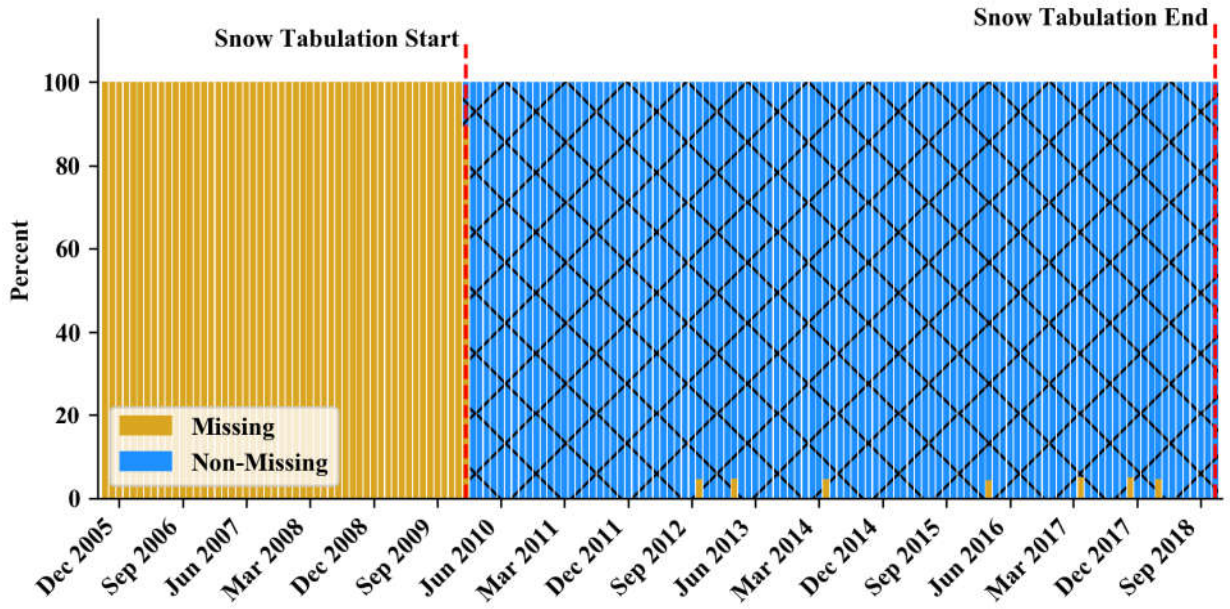


[1] The "present" is defined as November 2018. November 2018 was the latest time period available to Dr. Snow before filing his opening report.

[2] "Snow Tabulation Start" indicates the date Dr. Snow began counting missing data for his amended Figure 17. "Snow Tabulation End" indicates the date Dr. Snow stopped counting missing data for his amended Figure 17.

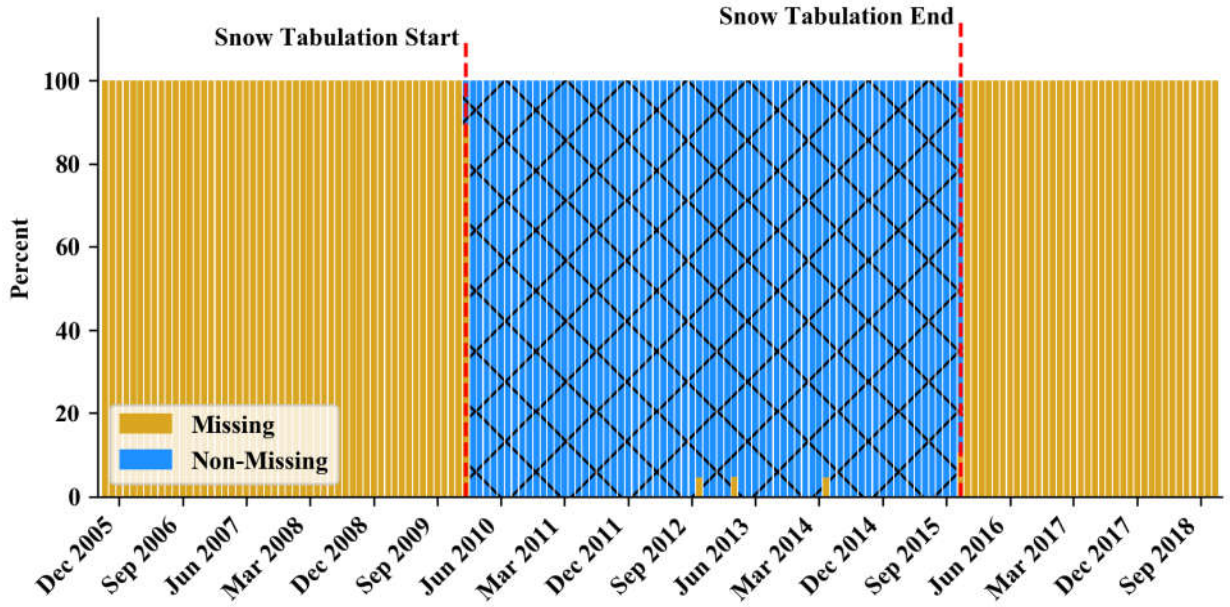
ABFC 2005-OPT1 M4

Percent of missing data: 32.28%



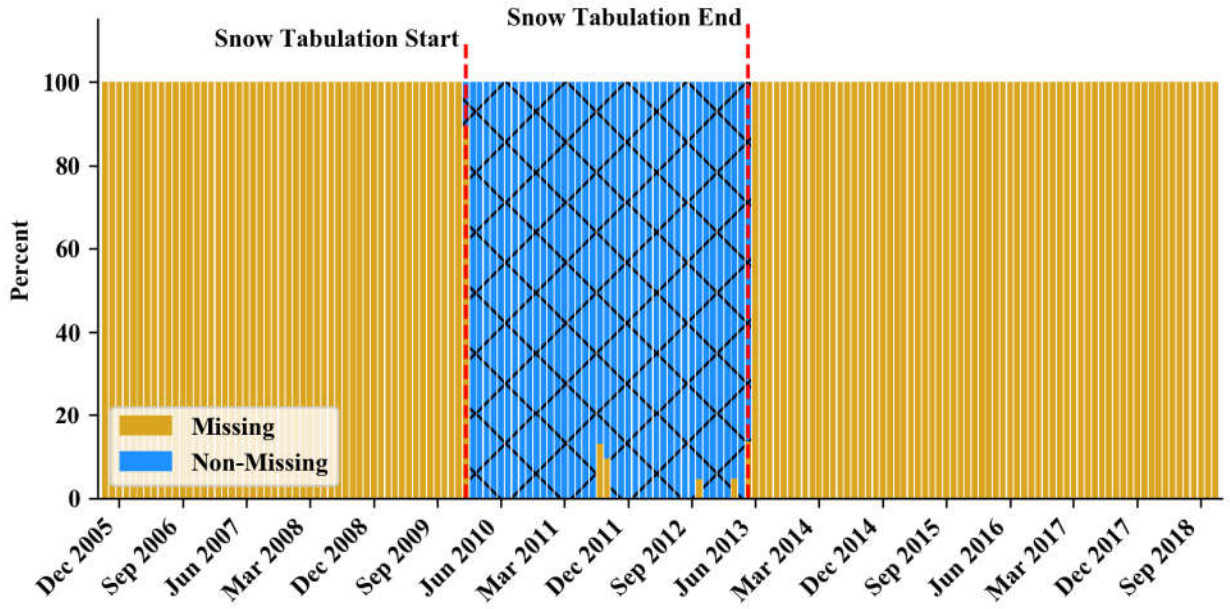
ABFC 2005-OPT1 M5

Percent of missing data: 55.06%



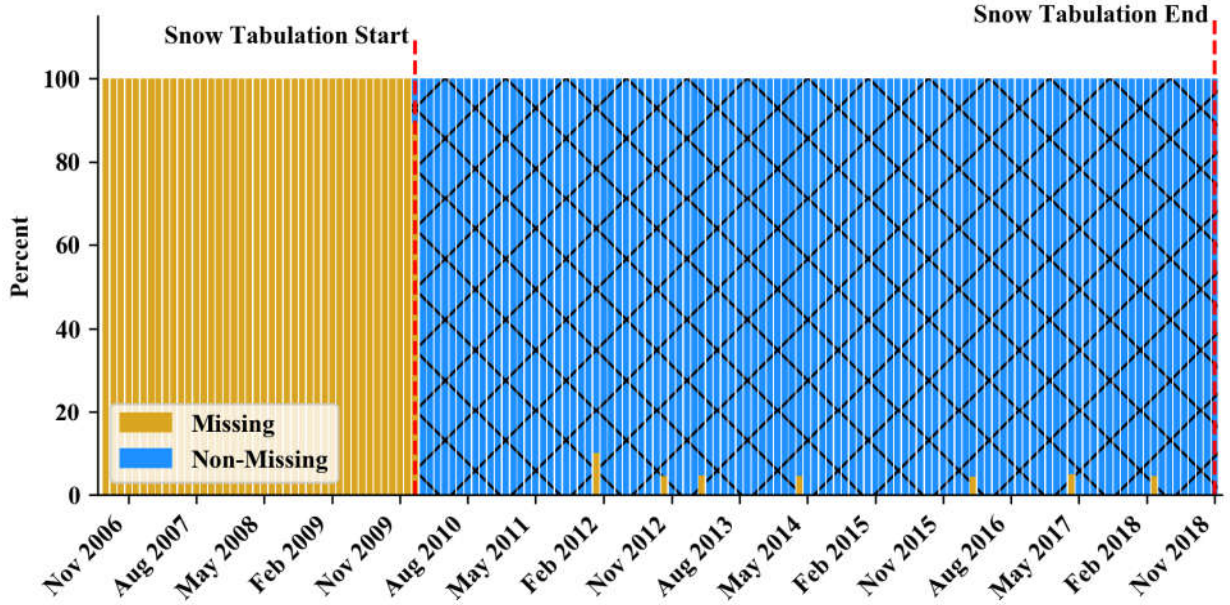
ABFC 2005-OPT1 M6

Percent of missing data: 74.05%



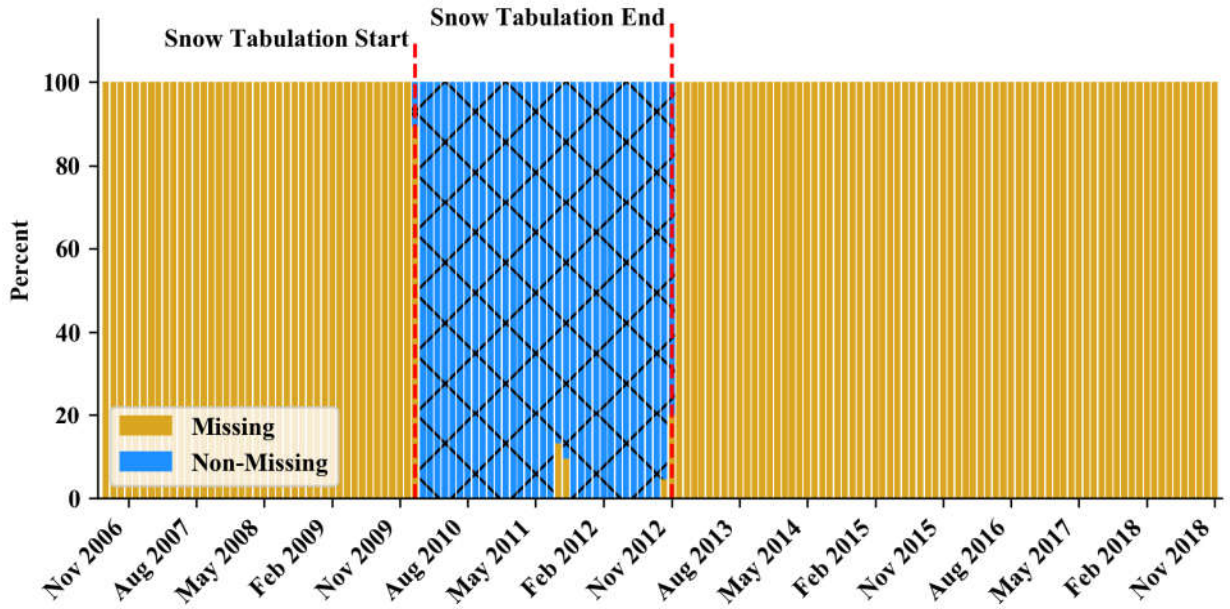
ABFC 2006-OPT1 M1

Percent of missing data: 27.7%



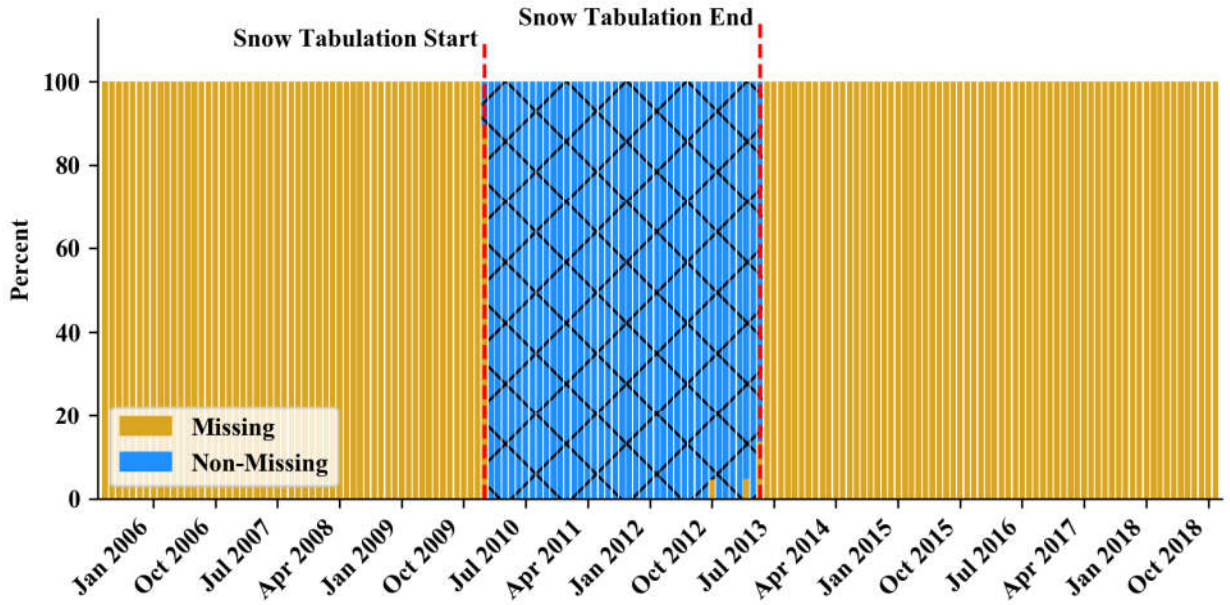
ABFC 2006-OPT1 M3

Percent of missing data: 76.35%



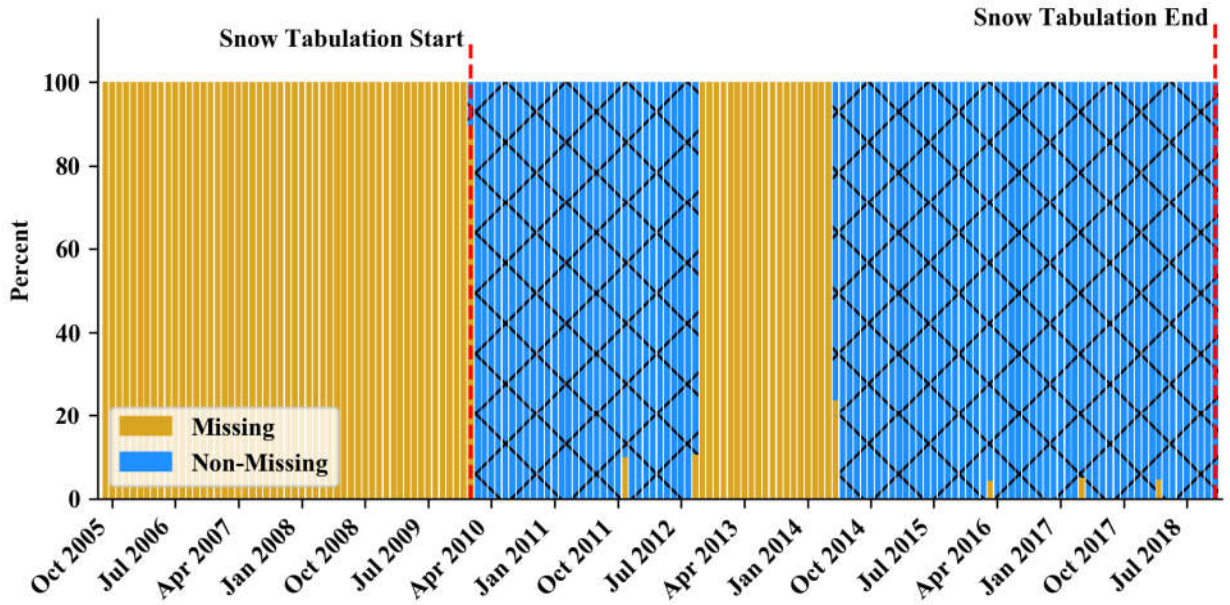
ABSHE 2005-HE5 M8

Percent of missing data: 74.69%



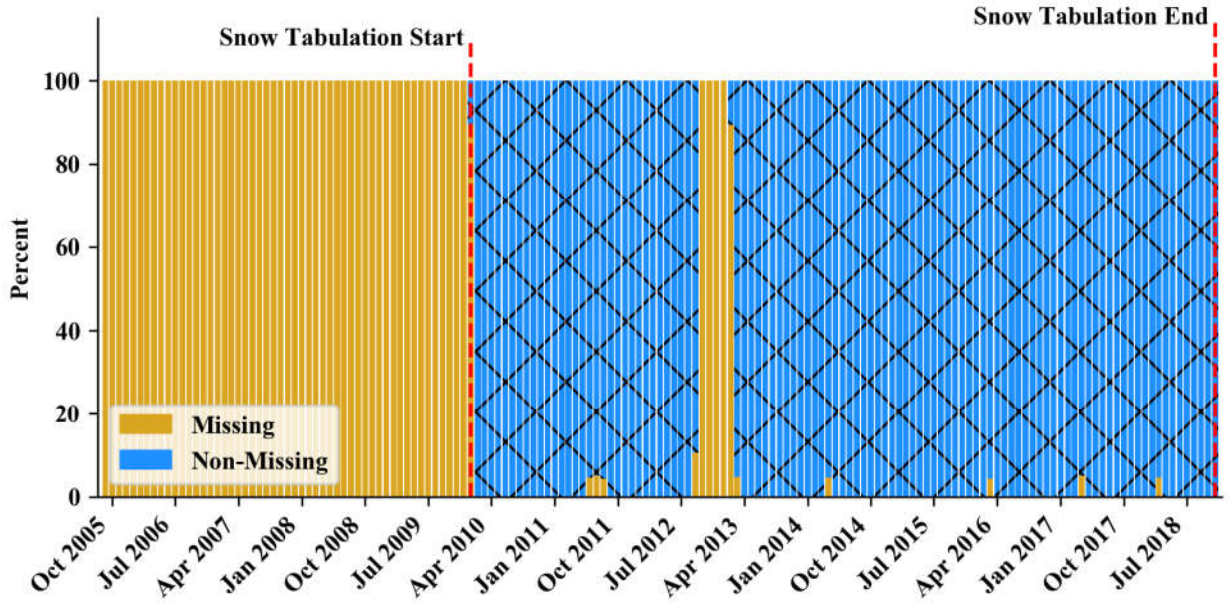
CMLTI 2005-OPT4 M5

Percent of missing data: 44.65%



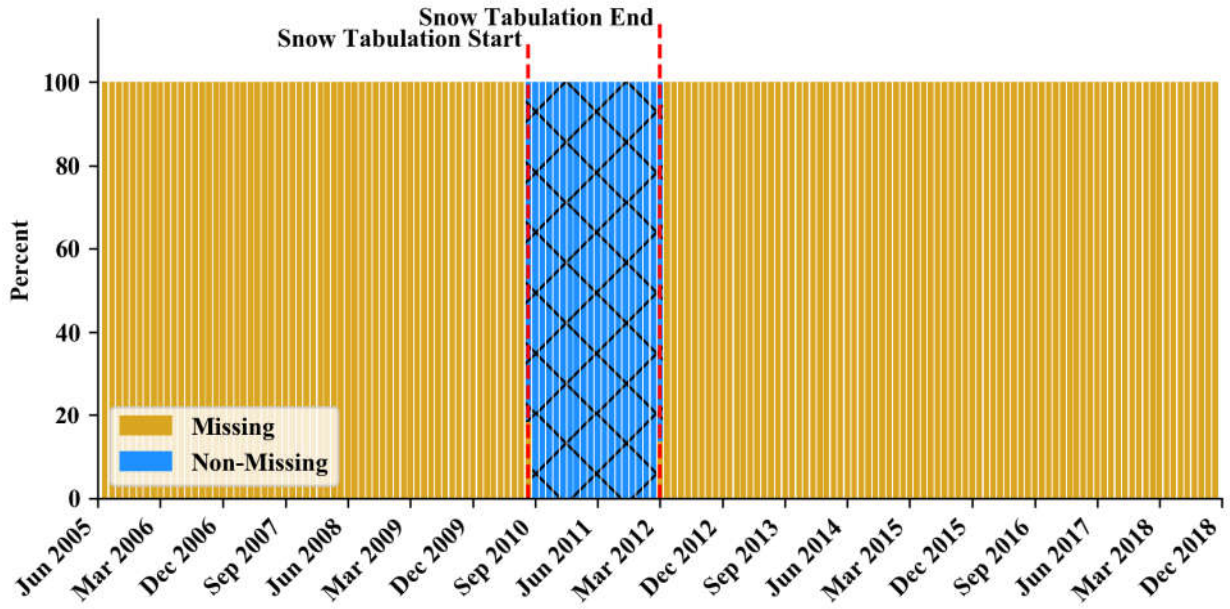
CMLTI 2005-OPT4 M6

Percent of missing data: 35.22%



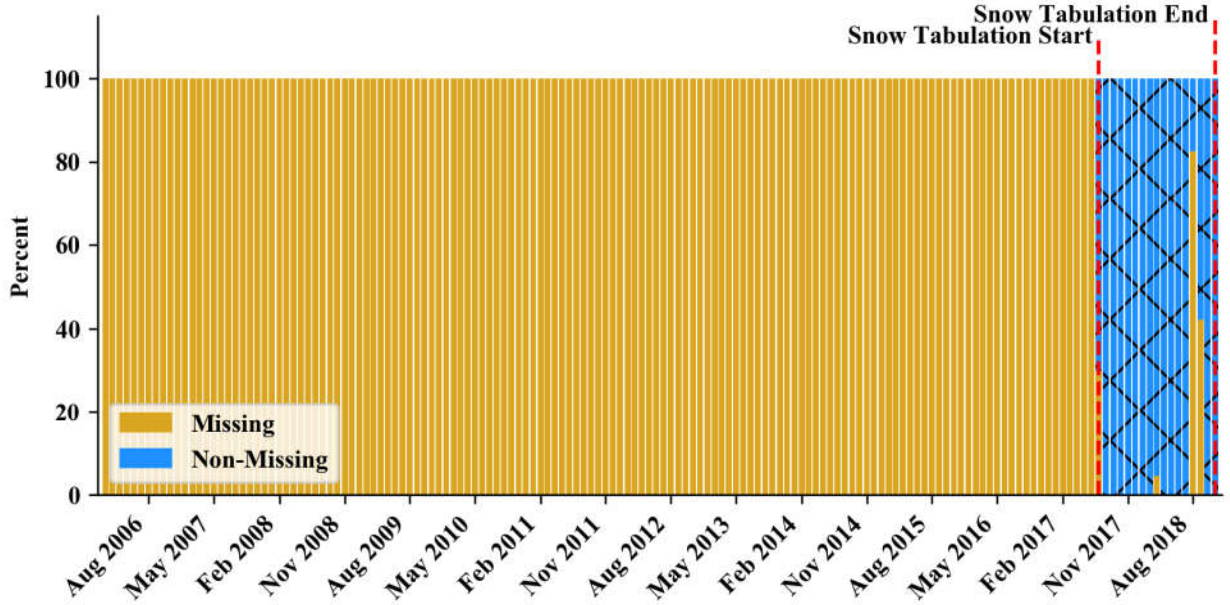
GPMF 2005-AR4 2A2

Percent of missing data: 87.58%



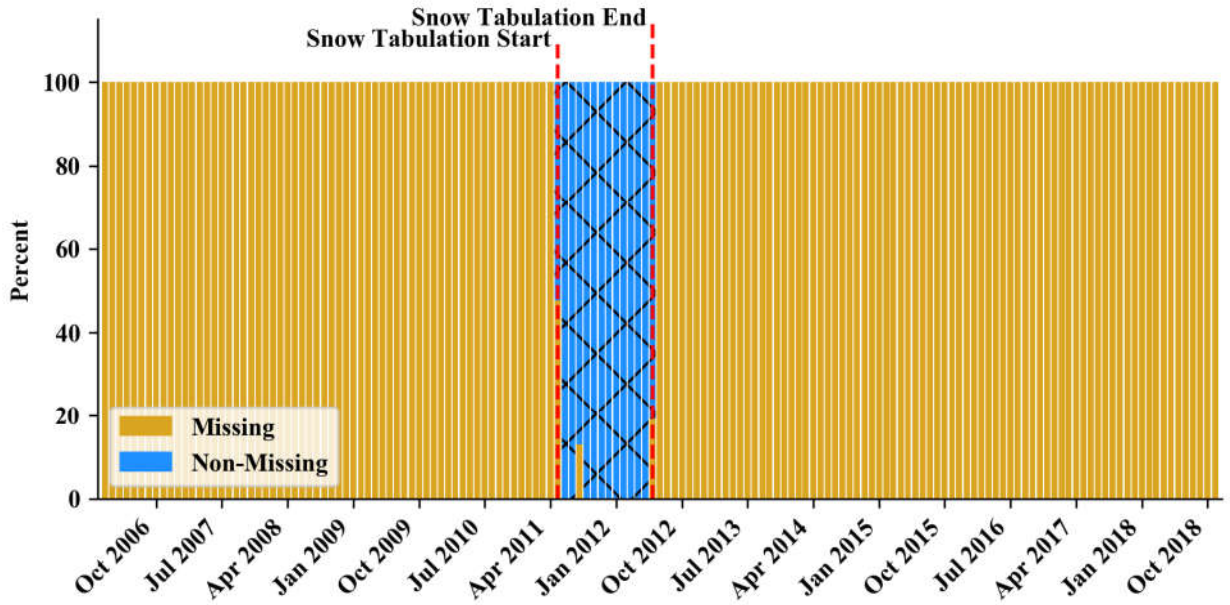
GPMF 2006-AR1 A2A

Percent of missing data: 88.96%



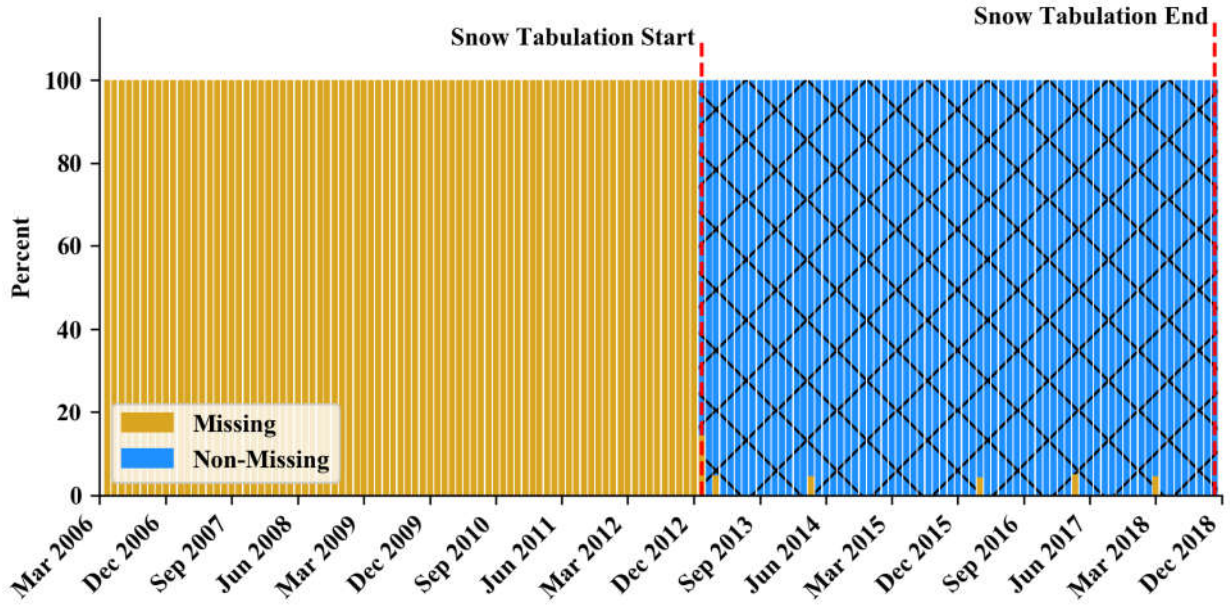
GPMF 2006-AR2 3A3

Percent of missing data: 90.85%



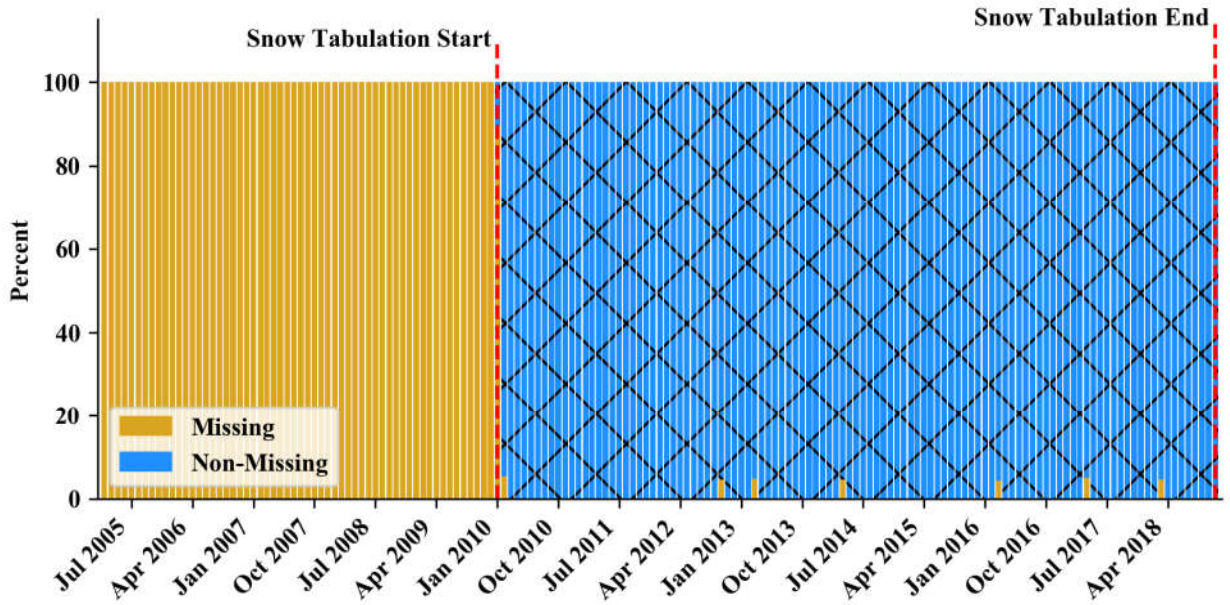
GPMF 2006-AR3 4A2

Percent of missing data: 53.29%



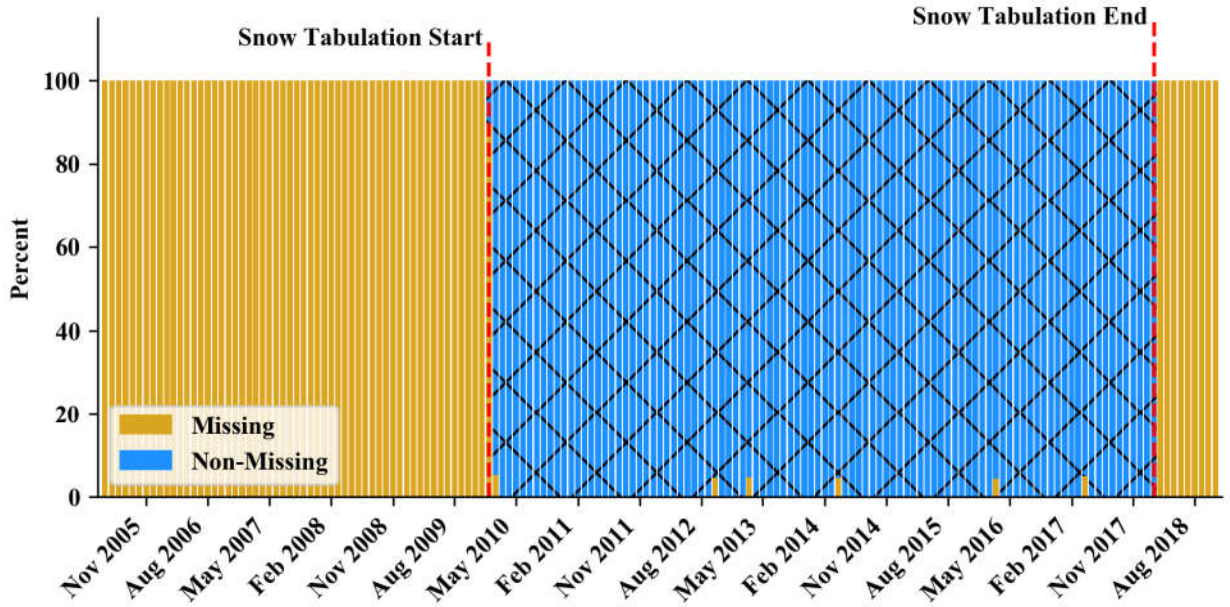
MSAC 2005-WMC2 M4

Percent of missing data: 35.15%



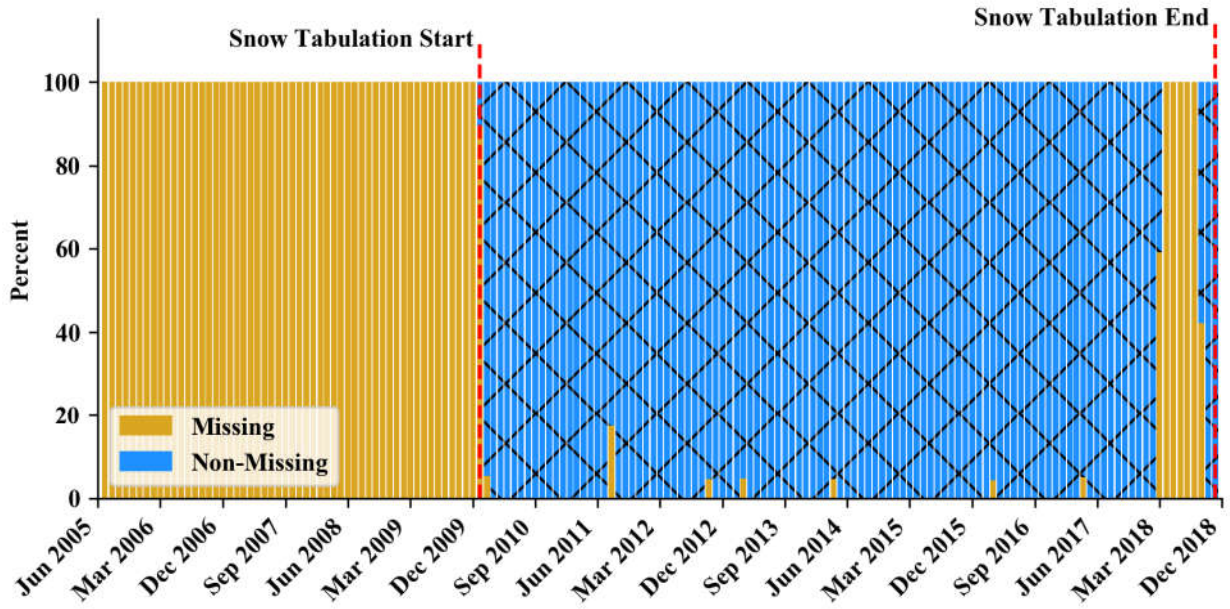
MSAC 2005-WMC3 B1

Percent of missing data: 39.88%



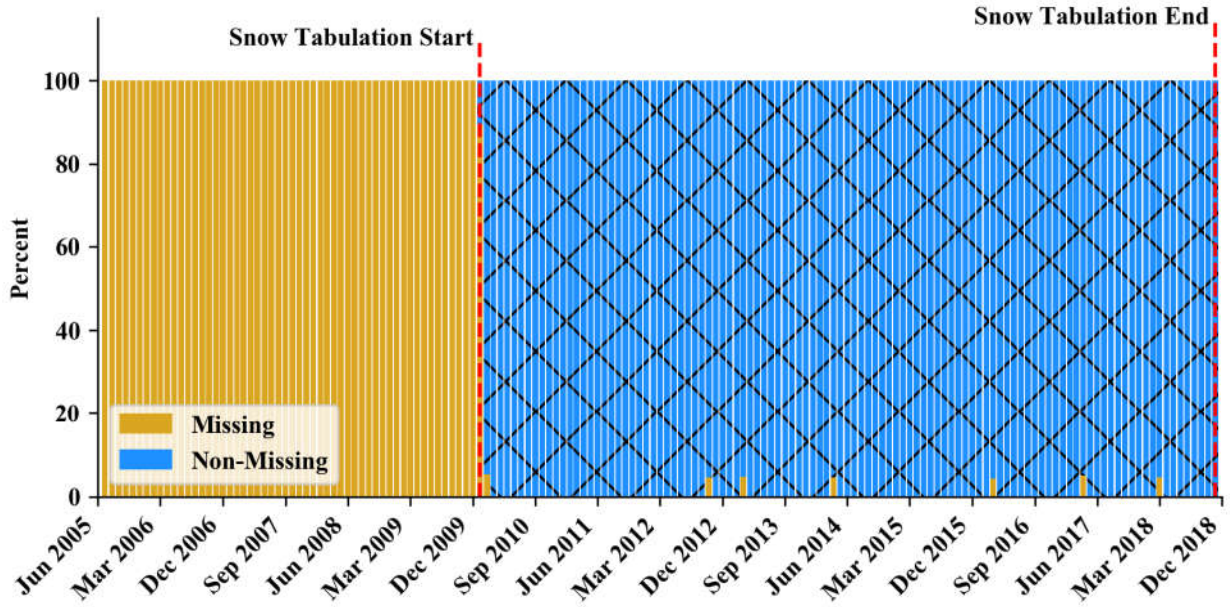
MSAC 2005-WMC5 B1

Percent of missing data: 36.65%



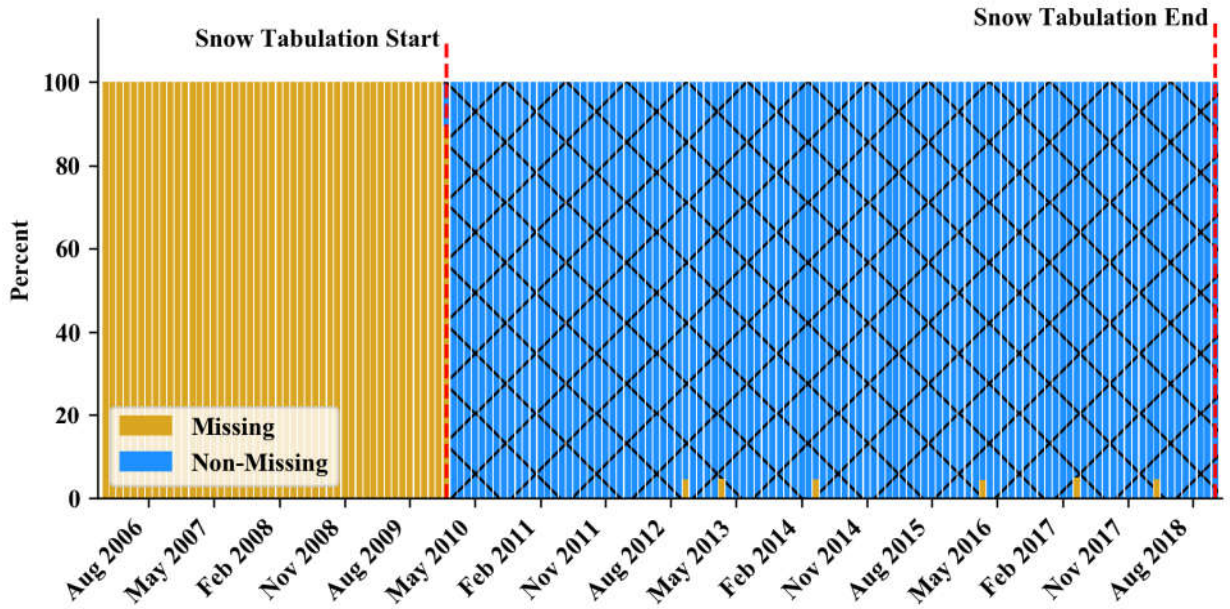
MSAC 2005-WMC5 M6

Percent of missing data: 33.54%



MSAC 2006-HE1 A4

Percent of missing data: 30.52%



OOMLT 2006-2 2A4

Percent of missing data: 28.67%