Vista Index Services

Mortgage Default Index
MDX
April 2024

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Overview

- Vista Index Services (Vista), in association with Intercontinental Exchange, Inc. (ICE), is introducing a new Mortgage Default Index (MDX). MDX measures the cumulative credit event experience of mortgage borrowers in the United States.
- The loans are drawn from Mortgage-Backed Securities (MBS) issued by agencies and fit certain eligibility criteria.
- MDX focuses solely on credit events, such as serious delinquencies and modifications. Loss severity considerations are simplified, allowing for timely determinations of MDX Index changes.
- MDX is designed to be used as a tradeable benchmark for financial products, including index swaps and other derivatives, that appeal broadly within the fixed income market.
- MDX and associated financial products are intended to attract additional capital into the mortgage market and provide policymakers and market participants with forward-looking indicators of household credit risk.

MDX – An '*Elegantly Simple*' Mortgage Borrower Index

- MDX is a residential mortgage loan-based index designed to measure the occurrence of borrowers experiencing defined credit events involving serious delinquency or remedial action – not necessarily default or liquidation.

- The eventual resolution of the borrower's obligation and the underlying property is neither measured by nor incorporated into MDX.

- MDX is designed to be used as a benchmark in financial products, including swaps, incorporating well-established credit default methodologies from corporate indices (CDX).

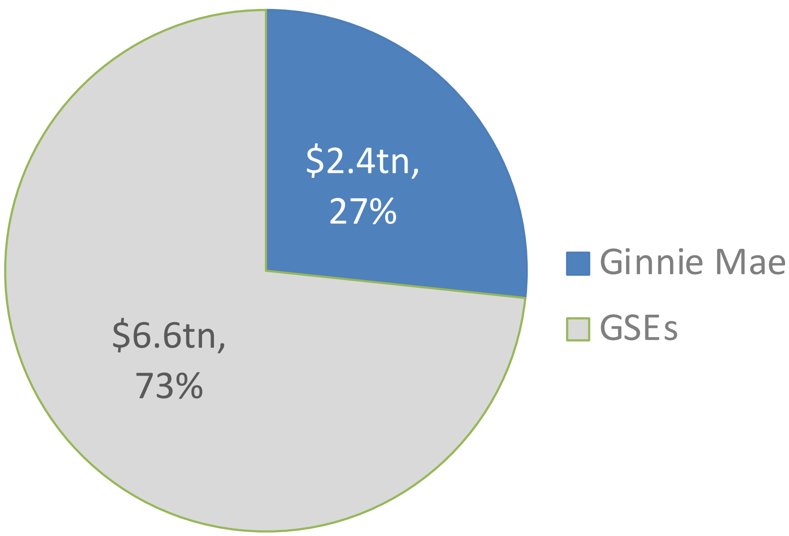
- MDX-based financial products are not designed to be synthetic mortgage credit bonds.

- Key design principles for MDX include:
  - Transparent and reliable data, definitions, and rules
  - Single risk factor – mortgage credit events – with no ambiguity or uncertainty
  - Broad representation of US mortgage borrowers
  - Expansive application as a benchmark for capital-efficient financial products.

Mortgage Borrowers in MDX

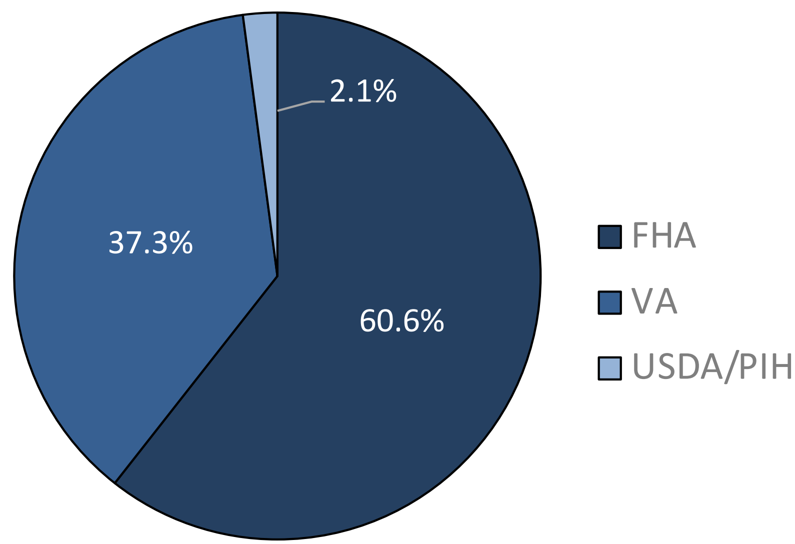
- MDX references residential loans in Ginnie Mae MBS in its first index series, MDX.GN.
- Ginnie Mae MBS pools include loans guaranteed under programs through four different government agencies: the Federal Housing Administration (FHA), the U.S. Department of Veterans Affairs (VA), the U.S. Department of Agriculture Rural Development (USDA), and the Housing and Urban Development's Office of Public and Indian Housing (PIH).
- Ginnie Mae reference loans represent a broad and diverse cross-section of borrowers across the US.

Agency Mortgage Backed Securities Outstanding



Sources: eMBS, Urban Institute; Jan 2024

Ginnie Mae MBS Pool Loans by Program Agency



Source: Ginnie Mae, 2023 Issuance

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MDX Loan Selection

- Every MDX Series selects mortgage loans that are included in a Ginnie Mae II MBS pool and meet certain loan eligibility criteria.

- Each MDX Series is formed by aggregating these reference loans into six-month pool origination date intervals with a twelve-month loan age limitation. Pool origination and loan age ranges are intended to create distinct groups by loan underwriting vintage.

- Additional criteria to ensure consistency across Series include:
  - Single family purchase and refinance loans only
  - 20 to 30 year original term to maturity

- Each MDX Series has unique loans with no overlap versus another Series. After a four-month seasoning period, prepaid, modified, or delinquent loans are removed prior to Series publication (See Appendix 1 for full rules).

- A new MDX Series begins in March and September and ends in ten years.

MDX Mechanics

- MDX measures the cumulative # of reference loans experiencing defined credit events relative to the total # of reference loans within an MDX Series.

- MDX is equal-weighted by loan count and ignores differing unpaid principal balances.

- The total loan count in each MDX Series remains constant regardless of prepayments or credit events.

- MDX is updated monthly and is expressed as a percentage (%) using the following formula:
  - $\left[1 + \left(\frac{Cumulative\ \#of\ loans\ experiencing\ a\ Credit\ Event}{Total\ \#\ of\ loans\ in\ MDX\ Series}\right)\right] \times 100 = MDX\ Value$
  - Example: $\left[1 + \left(\frac{20{,}000}{1{,}000{,}000}\right)\right] \times 100 = 102.000\%$

- All MDX loan sourcing and computations are provided by Black Knight, a division of ICE Data Services[1], as specified by Vista acting in its role as the Index Administrator.

[1] Black Knight Inc., the premier US mortgage data provider, was acquired by ICE on September 4, 2023.

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MDX Credit Events

- "Credit Events" are measured in each MDX Series by the number of loans that are:
  - Seriously delinquent (120 days delinquent); or
  - Modified.
- MDX Credit Events align with traditional agency loan buyout policies for MBS pools, as delinquent and modified loans are treated as Credit Events.
- Seriously delinquent loans are characterized as Credit Events regardless of forbearance.
- Modified loans are identified as loans that leave the MBS pool database that are flagged for loss mitigation.
- Once a loan is characterized as having experienced a Credit Event, it cannot cure and is treated with a <u>100% loss severity</u>.

MDX Methodology FAQs

- Why are loans defined as Credit Events when they experience seriously delinquency instead of liquidation?
  - Avoids varying liquidation timelines based on differing servicing and judicial considerations.
  - Mirrors agency historical practice of loan buyouts (i.e. MBS loan repurchases).
  - Follows the credit event practices of auto lenders (90d), credit card issuers (120 – 180d).

- Why are Credit Events assigned a 100% fixed severity?
  - Measures the occurrence of Credit Events – not their associated losses.
  - Allows for a consistent approach that avoids the complexity associated with unpaid principal balances and actual liquidation recoveries.
  - Enables accurate and timely monthly reporting of Credit Events.
  - Optimizes the efficiency of notional amounts used in MDX-based financial products (i.e. higher severity requires less notional for same outcome) (e.g. 25% fixed severity would need 4x notional).

- What happens when a loan prepays in an MDX Series?
  - Prepaid loans remain in the MDX denominator but never enter the MDX numerator for calculating the value of the index.
  - Prepays have the effect of reducing the universe of loans that can become Credit Events.

- What will the total # of loans be in each MDX Series?
  - Total loan count will vary depending on the amount of origination underlying agency pool issuance occurring within each loan inclusion period.

Initial MDX-Based Financial Products – MDX Swaps

- MDX derivatives enable market participants to mitigate or source mortgage credit risk – specifically, the risk of borrowers experiencing Credit Events as defined in each MDX Series.

- MDX swaps are credit default swaps where investors can buy protection (sell risk) and pay fixed coupon amounts **OR** sell protection (buy risk) and pay "floating" amounts based on Credit Events. MDX swap transactions are described from the viewpoint of the protection buyer.

MDX Swap Buyer (Short Risk)	MDX Swap Seller (Long Risk)
Buys credit protection on MDX Series loans	Sells credit protection on MDX Series loans
Pays fixed quarterly coupon	Receives fixed quarterly coupon
Receives variable amounts based on Credit Events	Pays variable amounts based on Credit Events

MDX Swap Payment Mechanics

- MDX swap values and payments are calculated on the notional amount of the swap. Notional amounts are computed by multiplying the nominal value of the swap *times* the MDX Factor.

- Each month, the MDX Factor is updated based on the Credit Events occurring since the prior month and results in a write-down of the notional amount of the swap.

- The MDX Factor itself is the inverse of the MDX Value of the underlying Series used as the benchmark for the swap and is calculated based on the following:

  - $1 - \left(\frac{Cumulative\ \#of\ loans\ experiencing\ a\ Credit\ Event}{Total\ \#\ of\ loans\ in\ the\ Series}\right) = MDX\ Factor$
  - Example: $1\ -\ \left(\frac{20{,}000}{1{,}000{,}000}\right) = 0.980000$

- The protection buyer makes quarterly coupon payments to the protection seller based on a [2%] coupon rate *times* the current notional amount of the swap (coupon rate TBD).

- The protection seller experiences a monthly write-down of the notional value of the swap (the "Credit Event Write-Down"). It is reflected in a payment from the Swap Seller to the Swap Buyer through the clearing process, sale value, or final swap closeout value.

- MDX swaps are expected to have an initial 5.25 year tenor/duration *(same as CDX)*.

MDX Swaps – A True Mortgage Credit Derivative

Three components of MDX swaps contribute to pricing the MDX Trade Spread, creating the correlation with mortgage market risks:

1. Credit Event Write-Downs
   - Fact: A certain number of mortgage borrowers fail to make payments each month.
   - MDX swaps reflect the cumulative mortgage credit performance of borrowers through monthly reporting of Credit Events and MDX Factor changes.

2. Credit Event Spread
   - Fact: Market participants have spread views on future mortgage borrower credit performance.
   - MDX swaps reflect long-term market expectations of mortgage payment delinquencies and distress through transaction pricing of Credit Events in the MDX Trade Spread.

3. Risk Premium Spread
   - Fact: Mortgage credit spreads move in correlation with general macro credit risk.
   - MDX swaps reflect credit spreads, volatility assumptions, and liquidity conditions in the market through transaction pricing of the risk premium in the MDX Trade Spread.

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MDX Swap Trading Return – Example #1

Trade Horizon of September 2018 through September 2019 *(For Illustrative Purposes)*

MDX.GN Sep 5 Year, On-The-Run, December 2023 Swap Termination, 5.25yr Initial Duration

	Sep 20, 2018	Dec 20, 2018	Mar 20, 2019	Jun 20, 2019	Sep 20, 2019
MDX Index Value	100.000000	100.002637	100.125097	100.364202	100.741410
MDX Factor (write down)	1.000000	0.999974	0.998749	0.996358	0.992586
Notional Amount ($10mm)	$ 10,000,000	$ 9,999,736	$ 9,987,490	$ 9,963,580	$ 9,925,859
MDX Trade Spread - Estimated [1] (bps)	**198**	**240**	**220**	**203**	**203**
Credit Event Spread (Estimated) [2] (bps)	137	150	154	149	143
Risk Premium (CDX.NA.IG) (bps)	61	90	66	54	60
Points Upfront	(0.090)	1.716	0.825	0.119	0.113
MDX Clean Swap Price	**$ 100.090**	**$ 98.284**	**$ 99.175**	**$ 99.881**	**$ 99.887**
Duration (years)	5.25	5.00	4.75	4.50	4.25
Clean Notional ($10mm value)	$ 10,009,000	$ 9,828,141	$ 9,905,094	$ 9,951,723	$ 9,914,643
MDX Fixed Coupon (200 bps running)	$ -	$ 50,000	$ 99,999	$ 149,936	$ 199,754
Total Value	$ 10,009,000	$ 9,878,141	$ 10,005,092	$ 10,101,659	$ 10,114,397
Net Return from Sep 2018 ($)	$ -	$ (130,859)	$ (3,908)	$ 92,659	$ 105,397
Net Return from Sep 2018 (bps)	-	(131)	(4)	93	105
Annualized Return (%)	-	**-5.23%**	**-0.08%**	**1.23%**	**1.05%**
Realized Credit Events (bps)	-	0	13	36	74
Implied Remaining Credit Events [3] (bps)	719	750	732	671	608
Implied Cumulative Credit Events (bps)	719	750	744	707	682

1 - MDX Trade Spread represents the sum of an implied Credit Event rate and a market risk premium.

2 - Credit Event Spread is an implied allocation of the MDX Trade Spread based on the expected annualized Credit Event rate.

3 - Implied Remaining Credit Events is the amount of Credit Events projected on the remaining swap term (Credit Event Spread x Remaining Swap Term).

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MDX Swap Investing Profile

- MDX swaps offer the ability to source broad mortgage credit exposure in a liquid and capital-efficient manner.
- Net returns are driven by borrower performance and not prepayment and collateral variables, creating a single risk factor investment.
- Swaps can be used to augment mortgage credit exposure and income when used as overlays to existing mortgage credit investments or as index positions within enhanced strategies.
- Investors can readily calibrate risk exposure through financial leverage rather than complex structural leverage embedded in mortgage credit securities.
- Investors can efficiently add or reduce their market exposures through a highly-liquid and robust swap market.
- MDX swaps have relatively modest price volatility when compared to many structured mortgage products, even under extreme changes in market conditions, as result of an unlevered structure and 5.25-year maximum duration.

MDX Swap Trading Return – Example #2

Trade Horizon of December 2019 through December 2020 *(For Illustrative Purposes)* MDX.GN Sep 5 Year, On-The-Run, December 2024 Swap Termination, 5yr Initial Duration	**Dec 20, 2019**	**Mar 20, 2020**	**Jun 22, 2020**	**Sep 21, 2020**	**Dec 21, 2020**
MDX Index Value	100.000000	100.000774	100.134363	104.836543	107.188555
MDX Factor (write down)	1.000000	0.999992	0.998656	0.951635	0.928114
Notional Amount ($10mm)	$ 10,000,000	$ 9,999,923	$ 9,986,564	$ 9,516,346	$ 9,281,145
MDX Trade Spread - Estimated [1] (bps)	**186**	**414**	**376**	**267**	**208**
Credit Event Spread (Estimated) [2] (bps)	141	262	300	215	153
Risk Premium (CDX.NA.IG) (bps)	45	152	76	52	55
Points Upfront	(0.608)	8.450	6.700	2.485	0.284
MDX Clean Swap Price	**100.608**	**91.550**	**93.300**	**97.515**	**99.716**
Duration (years)	5.00	4.75	4.50	4.25	4.00
Clean Notional ($10mm value)	$ 10,060,800	$ 9,154,929	$ 9,317,464	$ 9,279,865	$ 9,254,786
MDX Fixed Coupon (200 bps running)	$ -	$ 50,000	$ 100,000	$ 149,932	$ 197,514
Total Value	$ 10,060,800	$ 9,204,929	$ 9,417,464	$ 9,429,797	$ 9,452,300
Net Return from Dec 2019 ($)	$ -	$ (855,871)	$ (643,336)	$ (631,003)	$ (608,500)
Net Return from Dec 2019 (bps)	-	(851)	(639)	(627)	(605)
Annualized Return (%)	-	**-34.03%**	**-12.79%**	**-8.36%**	**-6.05%**
Realized Credit Events (bps)	-	0	13	484	719
Implied Remaining Credit Events [3] (bps)	705	1,245	1,350	914	612
Implied Cumulative Credit Events (bps)	705	1,245	1,363	1,397	1,331

1 - MDX Trade Spread represents the sum of an implied Credit Event rate and a market risk premium.

2 - Credit Event Spread is an implied allocation of the MDX Trade Spread based on the expected annualized Credit Event rate.

3 - Implied Remaining Credit Events is the amount of Credit Events projected on the remaining swap term (Credit Event Spread x Remaining Swap Term).

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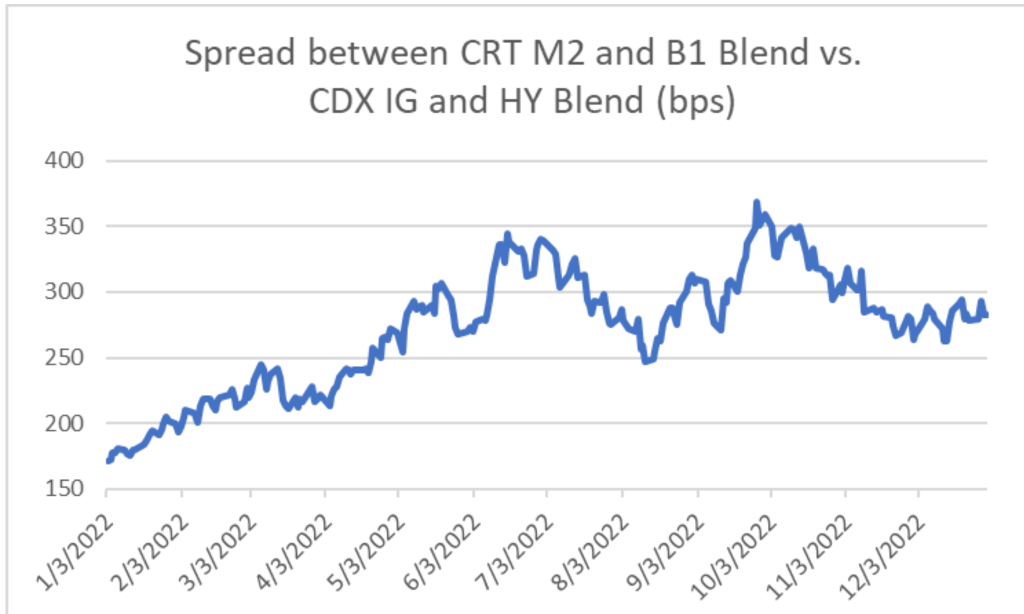
MDX Swap Hedging Profile

- Residential mortgage investing and lending involves significant credit risk management.
- There are no financial products that provide reliable mortgage credit correlation for hedging purposes.
- Investors and lenders regularly suffer substantial losses due to poorly-correlated hedge positions – limiting their appetite for additional residential mortgage risk.
- Most mortgage credit hedging strategies involve using CDX IG and/or HY.
- The chart at the right shows the lack of correlation between the two markets over the past year.
- MDX improves correlations by referencing mortgage borrowers.



Source: Vista Index Services

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Conclusion – Why MDX?

What does MDX offer?

- MDX delivers a transparent credit benchmark that applies well-established index principles to the representative US mortgage borrower data available in the marketplace – something that does not currently exist.
- MDX-based financial products will provide investors with new means of mitigating and accessing mortgage credit risk – offering instruments with a combined capital and risk profile that are highly efficient.

Why does this matter?

- The capital and risk benefits of MDX derivatives will create optimized hedging and better levered returns on mortgage credit risk than are currently available in the market.
- MDX will attract new investors and enable market participants to manage risk exposures more efficiently, bringing more capital to the mortgage market, and ultimately helping borrowers.
- MDX will offer improved forecasting to market participants and policymakers through transparent mortgage credit performance data tied directly to transaction-based market prices.

About ICE Data Services

ICE Data Services (Including Black Knight), a division of Intercontinental Exchange (NYSE: ICE), is the premier provider of integrated technology, data and analytics to the mortgage industry. Mortgage lenders, servicers, investors, government agencies, regulators, think tanks, trade associations, mortgage insurers and other housing and mortgage operators look to Black Knight first to help successfully manage the entire loan lifecycle and for regulatory, policy, research, predictive and analytical applications.

ICE Data Services offerings include a wide range of technology, data, analytics, aggregation, reporting products and services, touching every facet of residential mortgage and the housing ecosystem to deliver innovative and seamless solutions to support clients with best of breed capabilities and functionality.

ICE Data Services provides the industry-leading US property database which covers all 3,100+ US counties and includes over 155 million property records and more than 840 million real estate transactions. Through its McDash product group, ICE collects and delivers the most comprehensive loan-level mortgage performance database in the industry with over 100 unique attributes per loan. This vast database is further expanded and enhanced by leveraging Black Knight's servicing platform, MSP®. MSP® is the servicing system of record for primary mortgage servicing and currently houses a significant majority of US residential mortgages.

For more about ICE/Black Knight capabilities, visit www.BlackKnightInc.com.

Appendix 1: MDX.GN Loan Inclusion Rules

MDX.GN Loan Inclusion Rules for each new MDX Ginnie Mae Series are followed in the sequential order listed below:

1. Loan selection takes place during the second week of February and August each year.
2. Eligible loans are chosen from the Ginnie Mae MBS pool database during the latest reporting period.
3. Loans must be contained within a Ginnie Mae II MBS eligible pool.
4. Loans must have a pool origination date within the most recent eligible six-month window (June – November for March or December – May for September).
5. Loans must have a loan origination date within twelve months of the Pool Origination Cutoff Date.
6. Loans must be specified as either Purchase or Refinance type single family mortgages and have an original maturity of 241-360 months at origination.
7. Loans that previously have been delinquent 30 days or greater, modified, or prepaid are removed.

Appendix 2: MDX.GN Loan Selection & Series Release Calendar

MDX.GN Series Number	MDX.GN Series Start Date	Latest Pool Origination Cutoff Date	Loan Selection Process Start Date	Comment Release Date	Comment End Date	Final Production Release Date	MDX.GN Market Release Date
1	3/10/22	11/30/21	2/11/22	2/18/22	2/25/22	3/9/22	3/10/22
2	9/13/22	5/31/22	8/12/22	8/19/22	8/26/22	9/12/22	9/13/22
3	3/10/23	11/30/22	2/10/23	2/17/23	2/24/22	3/9/23	3/10/23
4	9/13/23	5/31/23	8/11/23	8/18/23	8/25/23	9/12/23	9/13/23
5	3/12/24	11/30/23	2/9/24	2/16/24	2/23/24	3/11/24	3/12/24
6	9/12/24	5/31/24	8/9/24	8/16/24	8/23/24	9/11/24	9/12/24
7	3/12/25	11/30/24	2/14/25	2/21/25	2/28/25	3/11/25	3/12/25
8	9/11/25	5/31/25	8/8/25	8/15/25	8/22/22	9/10/25	9/11/25
9	3/11/26	11/30/25	2/13/26	2/20/26	2/27/26	3/10/26	3/11/26
10	9/11/26	5/31/26	8/14/26	8/21/26	8/28/26	9/10/26	9/11/26
11	3/10/27	11/30/26	2/12/27	2/19/27	2/26/27	3/9/27	3/10/27
12	9/13/27	5/31/27	8/13/27	8/20/27	8/27/27	9/10/27	9/13/27

Date Calculation Guide	*8th Business Day of the Month*	*Last Actual Day of May or November*	*2nd Friday of the Month*	*3rd Friday of the Month*	*4th Friday of the Month*	*7th Business Day of the Month*	*8th Business Day of the Month*

Note: MDX.GN Series 1 through Series 4 will be released in January 2024 with the initial creation of MDX.GN. These four Series will be published for ten years from their original as-of release dates (e.g. Series 1 publication will expire on 3/10/32).

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Appendix 3: MDX.GN Historical and Series Values