PROYECTO MÁSTER

MODELO DE ASIGNACIÓN DE CUPO PARA TARJETAS DE CRÉDITO

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# Anexo 1.1. Cuestiones Legales (Anexo 1)

**NORMA DE CONTROL PARA LA GESTIÓN DEL RIESGO DE CRÉDITO Y LA CONSTITUCIÓN DE PROVISIONES EN LAS FUNDACIONES Y CORPORACIONES CIVILES QUE TENGAN COMO OBJETO PRINCIPAL EL OTORGAMIENTO DE CRÉDITOS, PARA LOS FINES DE LO DISPUESTO POR EL ARTÍCULO 8 DEL REGLAMENTO GENERAL DE LA LEY ORGÁNICA DE APOYO HUMANITARIO PARA COMBATIR LA CRISIS SANITARIA DERIVADA DEL COVID 19**

SUBSECCIÓN II: DE LA GESTIÓN DEL RIESGO DE CRÉDITO Artículo. 4.- De la gestión del riesgo de crédito.- La gestión del riesgo de crédito deberá contemplar como mínimo lo siguiente: 1. Contar con un proceso formalmente establecido de administración del riesgo de crédito en: otorgamiento, seguimiento y recuperación que asegure la calidad de sus portafolios y además permita identificar, medir, priorizar, controlar, mitigar, monitorear y comunicar las exposiciones de riesgo de contraparte y las pérdidas crediticias, a fin de mantener una adecuada cobertura de provisiones o de patrimonio técnico; 2. Políticas para la gestión de riesgo de crédito; 3. Límites de exposición al riesgo de crédito de la entidad en los distintos tipos de crédito y de tolerancia de la cartera improductiva por cada tipo de crédito; 4. Criterios para la determinación de tasas de interés para operaciones de crédito que consideren: montos, plazos, garantías, tipo de productos, destino del financiamiento; 5. Criterios para definir su mercado objetivo; es decir, el grupo de socios a los que se quiere otorgar créditos, como: zonas geográficas, sectores socio-económicos; 6. Perfiles de riesgo que comprende las características de los socios con los cuales se va a operar, como: edad, actividad económica, género, entre otros; y, 7. Tener y aplicar la infraestructura tecnológica y los sistemas necesarios para garantizar la adecuada gestión del riesgo de crédito, los cuales deben generar informes confiables sobre dicha labor. Artículo. 5.- Sistemas de información.- Las entidades deberán disponer de un sistema de información capaz de proveer a la administración y a las áreas involucradas, la información necesaria para identificar, medir, priorizar, controlar, mitigar y monitorear las exposiciones de riesgo, considerando parámetros de metodologías propias de esta gestión. Esta información deberá apoyar la toma de decisiones oportunas y adecuadas. El alcance y nivel de especialización del sistema estará en relación con el volumen de las transacciones de la entidad. Artículo. 6.- Metodologías.- Las entidades contarán con metodologías y técnicas basadas en el comportamiento histórico de los portafolios de las operaciones de crédito, que permitan determinar la pérdida crediticia sobre la base de la probabilidad de incumplimiento, el nivel de exposición y la severidad de la pérdida. Para el cálculo de estos componentes se deberá disponer de una base de datos mínima de tres (3) años inmediatos anteriores, que deberá contener elementos suficientes para el cálculo de los aspectos señalados.

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# Anexo 1.2. Cuestiones Legales (Anexo 2)

**NORMA DE CONTROL PARA LA GESTIÓN DEL RIESGO DE CRÉDITO**

SECCIÓN IV ELEMENTOS DE LA GESTIÓN DEL RIESGO DE CRÉDITO

Artículo 20.- Proceso de Otorgamiento.- Contempla el conocimiento del deudor para lo cual las entidades deben considerar al menos lo siguiente: 1. Capacidad de pago; 2. Condiciones financieras del crédito; 3. Garantías; 4. Fuentes de pago; 5. Factores externos que pueden afectar la situación del deudor; y, 6. Destino del crédito. Todos los análisis que se realicen al deudor, se deben aplicar al garante, codeudor o deudor solidario que estén vinculados a la respectiva operación de crédito, considerando como mínimo los siguientes aspectos: a. Información previa al otorgamiento de un crédito; b. Selección de variables y segmentación de líneas de crédito; c. Capacidad de pago del deudor; y, d. Garantías que respaldan la operación y criterios para estimar su valor y eficacia. Así mismo, en el caso de personas jurídicas, contar con la autorización del organismo interno competente y verificar la disposición estatutaria que corresponda para obligarse y otorgar garantías en respaldo de los créditos. Artículo 21.- Información previa al otorgamiento de un crédito.- Las entidades deben establecer procesos para facilitar el entendimiento por parte del potencial deudor sobre las condiciones de la operación crediticia, para lo cual deben suministrarle en forma íntegra y comprensible como mínimo la siguiente información: 1. Monto del crédito; 2. Tasa de interés efectiva anual; 3. Sistema de amortización; 4. Forma de pago de la obligación que incluya (Plazo, periodos de gracia, periodicidad de pago) 5. Tipo y cobertura de la garantía solicitada; 6. Información sobre las condiciones para pre cancelar la obligación o para realizar pagos anticipados los cuales afectan al capital y por ende se debe ajustar la tabla de amortización ya sean en plazo o en el valor de las cuotas; 7. Información del seguro de desgravamen en los casos que aplique (montos de cobertura, prima, exclusiones, etc.), para lo cual la entidad debe proporcionar al menos 3 opciones para elección del potencial deudor; y, 8. En caso de créditos refinanciados o reestructurados, se deberá mencionar que estos mecanismos se pueden aplicar de manera excepcional conforme la normativa vigente las condiciones propias del refinanciamiento y reestructuración, las implicaciones en términos de costos, calificación crediticia, y los efectos de incumplir con su pago. Las entidades deben disponer en sus archivos de la documentación que demuestre que previamente a la concesión de la operación informaron al deudor los términos y condiciones de la operación de crédito. Artículo 22.- Selección de variables - En el proceso de otorgamiento, las entidades deberán establecer, para cada una de los productos crediticios que manejan en función de los segmentos de crédito, las variables tanto cuantitativas como cualitativas de mayor relevancia que permitan discriminar los sujetos de crédito que se ajustan al perfil de riesgo determinado por la entidad. La selección de estas variables de discriminación y la importancia relativa que se dé a cada una de ellas debe ser un elemento determinante tanto en el otorgamiento como en el seguimiento del crédito y como base para su calificación. Esta metodología deberá permitir monitorear y controlar la exposición crediticia de los diferentes productos de crédito, así como del portafolio en general. Artículo 23. Capacidad de pago.- Las entidades deberán realizar la evaluación de capacidad de pago del deudor y garantes, para lo cual al menos deberán revisar la siguiente información: 1. Los flujos de ingresos y egresos, así como el flujo de caja de la contraparte que incluyan los egresos por pago de otras deudas; 2. La solvencia medida a través de variables como el nivel de endeudamiento y la calidad y composición de los activos, pasivos, patrimonio y contingencias del deudor; 3. Historial crediticio; 4. Los posibles efectos de los riesgos financieros a los que está expuesto el flujo de caja del deudor y/o del negocio a financiar según aplique, considerando distintos escenarios en función de variables económicas que puedan afectar el negocio o la capacidad de pago del deudor; y, 5. Los riesgos legales, operacionales y estratégicos a los que puede estar expuesta la capacidad de pago del deudor o el negocio a financiar. En los créditos de consumo se deberá dar prioridad a la determinación de la capacidad de pago del deudor y a la estabilidad de la fuente de sus recursos, provenientes de sueldos, salarios, honorarios, remesas, rentas promedios u otras fuentes de ingresos redituables, adecuadamente verificados por la entidades. Cuando se trate de microcréditos, la entidad debe contar con una metodología que le permita evaluar de manera adecuada la capacidad de pago del deudor y cuyos elementos permitan compensar las deficiencias de información, según sus características y grado de informalidad. La información requerida deberá ser obtenida y documentada en el lugar donde se desarrolla la actividad económica del deudor. Artículo 24.- Garantías.- Las entidades deberán: 1. Definir en sus políticas y manuales los criterios necesarios para la exigencia, aceptación, constitución y avalúo de garantías, el porcentaje de cobertura; y, 2. Contar con procesos de recepción, registro, custodia, seguimiento, avalúo y ejecución de las garantías recibidas.

Artículo 29.- Modelos y metodologías.- Las entidades de los segmentos 1, 2 y 3 deberán aplicar para la administración del riesgo de crédito modelos basados en metodologías y/o herramientas tecnológicas enfocadas a lo siguiente: 1. Modelo de otorgamiento: Permite a las entidades realizar la evaluación crediticia de los deudores definiendo un perfil de riesgo, el mismo asocia variables sociodemográficas, capacidad y fuente de repago, características, comportamiento de pago en la entidad y en el sistema financiero con la finalidad de evaluar al sujeto de crédito y definir una calificación. Se considera como un requisito previo para la aprobación, instrumentación y desembolso de las operaciones crediticias, posibilitando asignar un cupo y nivel de exposición; y, 2. Modelo de Seguimiento: Permite a las entidades realizar una evaluación y calificación de las operaciones crediticias otorgadas, considerando variables de comportamiento de pago e incumplimiento del sujeto de crédito en la entidad y en el sistema financiero por medio de metodologías de pérdidas esperadas e inesperadas, además las entidades deben observar lo dispuesto en la Sección IV “Norma para la Gestión del Riesgo de Crédito en las Cooperativas de Ahorro y Crédito y Asociaciones Mutualistas de Ahorro y Crédito para la Vivienda, del Capítulo XXXVI “Sector Financiero Popular y Solidario de la Codificación de Resoluciones de la Junta Financiera. Artículo 30.- Infraestructura tecnológica.- Las entidades de los segmentos 1, 2, 3, cajas centrales y la CONAFIPS, acorde con su tamaño, su naturaleza, complejidad y volumen de las operaciones que realizan, deberán disponer de una plataforma tecnológica y de sistemas necesarios para garantizar el funcionamiento efectivo, eficiente y oportuno de la gestión de riesgo de crédito, para lo cual, deben contar con soportes tecnológicos como software, hardware o un sistema de comunicación. DISPOSICIONES GENERALES PRIMERA.- Si en los procesos de supervisión se detectare un inadecuado análisis de la capacidad de pago de los deudores, la Superintendencia podrá disponer como límite máximo de exposición en las operaciones de consumo, que las cuotas mensuales pactadas no sobrepasen del 40% del ingreso neto mensual del deudor. SEGUNDA.- En los procesos de supervisión cuando el organismo de control evidencie que una entidad no mantiene una gestión de riesgo de crédito conforme la presente norma podrá disponer la suspensión de las colocaciones de los productos crediticios que mantengan debilidades hasta que las mismas sean subsanadas.

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# Anexo 1.3. Cuestiones Legales (Anexo 3)

**LEY DE PROTECCIÓN DE DATOS PERSONALES**

CAPÍTULO V TRANSFERENCIA O COMUNICACIÓN Y ACCESO A DATOS PERSONALES POR TERCEROS Art. 33.-Transferencia o comunicación de datos personales.-Los datos personales podrán transferirse o comunicarse a terceros cuando se realice para el cumplimiento de fines directamente relacionados con las funciones legítimas del responsable y del destinatario, cuando la transferencia LEY ORGÁNICA DE PROTECCIÓN DE DATOS PERSONALES - Página 18 FINDER LOYAL - www.lexis.com.ec se encuentre configurada dentro de una de las causales de legitimidad establecidas en esta Ley, y se cuente, además, con el consentimiento del titular. Se entenderá que el consentimiento es informado cuando para la transferencia o comunicación de datos personales el Responsable del tratamiento haya entregado información suficiente al titular que le permita conocer la finalidad a que se destinarán sus datos y el tipo de actividad del tercero a quien se pretende transferir o comunicar dichos datos. Art. 34.-Acceso a datos personales por parte del encargado.-No se considerará transferencia o comunicación en el caso de que el encargado acceda a datos personales para la prestación de un servicio al responsable del tratamiento de datos personales. El tercero que ha accedido legítimamente a datos personales en estas consideraciones, será considerado encargado del tratamiento. El tratamiento de datos personales realizado por el encargado deberá estar regulado por un contrato, en el que se establezca de manera clara y precisa que el encargado del tratamiento de datos personales tratará únicamente los mismos conforme las instrucciones del responsable y que no los utilizará para finalidades diferentes a las señaladas en el contrato, ni que los transferirá o comunicará ni siquiera para su conservación a otras personas. Una vez que se haya cumplido la prestación contractual, los datos personales deberán ser destruidos o devueltos al responsable del tratamiento de datos personales bajo la supervisión de la Autoridad de Protección de Datos Personales. El encargado será responsable de las infracciones derivadas del incumplimiento de las condiciones de tratamiento de datos personales establecidas en la presente ley. Art. 35.-Acceso a datos personales por parte de terceros.-No se considerará transferencia o comunicación cuando el acceso a datos personales por un tercero sea necesario para la prestación de un servicio al responsable del tratamiento de datos personales. El tercero que ha accedido a datos personales en estas condiciones debió hacerlo legítimamente. El tratamiento de datos personales realizado por terceros deberá estar regulado por un contrato, en el que se establezca de manera clara y precisa que el encargado del tratamiento de datos personales tratará únicamente los mismos conforme las instrucciones del responsable y que no los utilizará para finalidades diferentes a las señaladas en el contrato, ni que los transferirá o comunicará ni siquiera para su conservación a otras personas. Una vez que se haya cumplido la prestación contractual, los datos personales deberán ser destruidos o devueltos al responsable del tratamiento de datos personales bajo la supervisión de la autoridad de protección de datos personales. El tercero será responsable de las infracciones derivadas del incumplimiento de las condiciones de tratamiento de datos personales establecidas en la presente ley. Art. 36.-Excepciones de consentimiento para la transferencia o comunicación de datos personales. No es necesario contar con el consentimiento del titular para la transferencia o comunicación de datos personales, en los siguientes supuestos: 1) Cuando los datos han sido recogidos de fuentes accesibles al público; 2) Cuando el tratamiento responda a la libre y legítima aceptación de una relación jurídica entre el responsable de tratamiento y el titular, cuyo desarrollo, cumplimiento y control implique necesariamente la conexión de dicho tratamiento con base de datos. En este caso la transferencia o comunicación sólo será legítima en cuanto se limite a la finalidad que la justifique; 3) Cuando los datos personales deban proporcionarse a autoridades administrativas o judiciales en virtud de solicitudes y órdenes amparadas en competencias atribuidas en la norma vigente; LEY ORGÁNICA DE PROTECCIÓN DE DATOS PERSONALES - Página 19 FINDER LOYAL - www.lexis.com.ec 4) Cuando la comunicación se produzca entre Administraciones Públicas y tenga por objeto el tratamiento posterior de datos con fines históricos, estadísticos o científicos, siempre y cuando dichos datos se encuentren debidamente disociados o a lo menos anonimizados, y, 5) Cuando la comunicación de datos de carácter personal relativos a la salud sea necesaria para solucionar una urgencia que implique intereses vitales de su titular y este se encontrare impedido de otorgar su consentimiento. 6) Cuando la comunicación de datos de carácter personal relativos a la salud sea necesaria para realizar los estudios epidemiológicos de interés público, dando cumplimiento a los estándares internacionales en la materia de derechos humanos, y como mínimo a los criterios de legalidad, proporcionalidad y necesidad. El tratamiento deberá ser de preferencia anonimizado, y en todo caso agregado, una vez pasada la urgencia de interés público. Cuando sea requerido el consentimiento del titular para que sus datos personales sean comunicados a un tercero, este puede revocarlo en cualquier momento, sin necesidad de que medie justificación alguna. La presente ley obligatoriamente debe ser aplicada por el destinatario, por el solo hecho de la comunicación de los datos; a menos que estos hayan sido anonimizados o sometidos a un proceso de (sic). CAPÍTULO VI SEGURIDAD DE DATOS PERSONALES Art. 37.-Seguridad de datos personales.-El responsable o encargado del tratamiento de datos personales según sea el caso, deberá sujetarse al principio de seguridad de datos personales, para lo cual deberá tomar en cuenta las categorías y volumen de datos personales, el estado de la técnica, mejores prácticas de seguridad integral y los costos de aplicación de acuerdo a la naturaleza, alcance, contexto y los fines del tratamiento, así como identificar la probabilidad de riesgos. El responsable o encargado del tratamiento de datos personales, deberá implementar un proceso de verificación, evaluación y valoración continua y permanente de la eficiencia, eficacia y efectividad de las medidas de carácter técnico, organizativo y de cualquier otra índole, implementadas con el objeto de garantizar y mejorar la seguridad del tratamiento de datos personales. El responsable o encargado del tratamiento de datos personales deberá evidenciar que las medidas adoptadas e implementadas mitiguen de forma adecuada los riesgos identificados Entre otras medidas, se podrán incluir las siguientes; 1) Medidas de anonimización, seudonomización o cifrado de datos personales; 2) Medidas dirigidas a mantener la confidencialidad, integridad y disponibilidad permanentes de los sistemas y servicios del tratamiento de datos personales y el acceso a los datos personales, de forma rápida en caso de incidentes; y 3) Medidas dirigidas a mejorar la residencia técnica, física, administrativa, y jurídica. 4) Los responsables y encargados del tratamiento de datos personales, podrán acogerse a estándares internacionales para una adecuada gestión de riesgos enfocada a la protección de derechos y libertades, así como para la implementación y manejo de sistemas de seguridad de la información o a códigos de conducta reconocidos y autorizados por la Autoridad de Protección de Datos Personales. Art. 38.-Medidas de seguridad en el ámbito del sector público.-El mecanismo gubernamental de seguridad de la información deberá incluir las medidas que deban implementarse en el caso de tratamiento de datos personales para hacer frente a cualquier riesgo, amenaza, vulnerabilidad, accesos no autorizados, pérdidas, alteraciones, destrucción o comunicación accidental o ilícita en el tratamiento de los datos conforme al principio de seguridad de datos personales. LEY ORGÁNICA DE PROTECCIÓN DE DATOS PERSONALES - Página 20 FINDER LOYAL - www.lexis.com.ec El mecanismo gubernamental de seguridad de la información abarcará y aplicará a todas las instituciones del sector público, contenidas en el artículo 225 de la Constitución de la República de Ecuador, así como a terceros que presten servicios públicos mediante concesión u otras figuras legalmente reconocidas. Estas, podrán incorporar medidas adicionales al mecanismo gubernamental de seguridad de la información. Art. 39.-Protección de datos personales desde el diseño y por defecto.-Se entiende a la protección de datos desde el diseño como el deber del responsable del tratamiento de tener en cuenta, en las primeras fases de concepción y diseño del proyecto, que determinados tipos de tratamientos de datos personales entrañan una serie de riesgos para los derechos de los titulares en atención al estado de la técnica, naturaleza y fines del tratamiento, para lo cual, implementará las medidas técnicas, organizativas y de cualquier otra índole, con miras a garantizar el cumplimiento de las obligaciones en materia de protección de datos, en los términos del reglamento. La protección de datos por defecto hace referencia a que el responsable debe aplicar las medidas técnicas y organizativas adecuadas con miras a que, por defecto, solo sean objeto de tratamiento los datos personales que sean necesarios para cada uno de los fines del tratamiento, en los términos del reglamento. Art. 40.-Análisis de riesgo, amenazas y vulnerabilidades.-Para el análisis de riesgos, amenazas y vulnerabilidades, el responsable y el encargado del tratamiento de los datos personales deberán utilizar una metodología que considere, entre otras: 1) Las particularidades del tratamiento; 2) Las particularidades de las partes involucradas; y, 3) Las categorías y el volumen de datos personales objeto de tratamiento. Art. 41.-Determinación de medidas de seguridad aplicables.-Para determinar las medidas de seguridad, aceptadas por el estado de la técnica, a las que están obligadas el responsable y el encargado del tratamiento de los datos personales, se deberán tomar en consideración, entre otros: 1) Los resultados del análisis de riesgos, amenazas y vulnerabilidades; 2) La naturaleza de los datos personales; 3) Las características de las partes involucradas; y, 4) Los antecedentes de destrucción de datos personales, la pérdida, alteración, divulgación o impedimento de acceso a los mismos por parte del titular, sean accidentales e intencionales, por acción u omisión, así como los antecedentes de transferencia, comunicación o de acceso no autorizado o exceso de autorización de tales datos. El responsable y el encargado del tratamiento de datos personales deberán tomar las medidas adecuadas y necesarias, de forma permanente y continua, para evaluar, prevenir, impedir, reducir, mitigar y controlar los riesgos, amenazas y vulnerabilidades, incluidas las que conlleven un alto riesgo para los derechos y libertades del titular, de conformidad con la normativa que emita la Autoridad de Protección de Datos Personales. Art. 42.-Evaluación de impacto del tratamiento de datos personales.-El responsable realizará una evaluación de impacto del tratamiento de datos personales cuando se haya identificado la probabilidad de que dicho tratamiento, por su naturaleza, contexto o fines, conlleve un alto riesgo para los derechos y libertades del titular o cuando la Autoridad de Protección de Datos Personales lo requiera. La evaluación de impacto relativa a la protección de los datos será de carácter obligatoria en caso de: a) Evaluación sistemática y exhaustiva de aspectos personales de personas físicas que se base en LEY ORGÁNICA DE PROTECCIÓN DE DATOS PERSONALES - Página 21 FINDER LOYAL - www.lexis.com.ec un tratamiento automatizado, como la elaboración de perfiles, y sobre cuya base se tomen decisiones que produzcan efectos jurídicos para las personas naturales; b) Tratamiento a gran escala de las categorías especiales de datos, o de los datos personales relativos a condenas e infracciones penales, o c) Observación sistemática a gran escala de una zona de acceso público. La Autoridad de Protección de Datos Personales establecerá otros tipos de operaciones de tratamiento que requieran una evaluación de impacto relativa a la protección de datos. La evaluación de impacto deberá efectuarse previo al inicio del tratamiento de datos personales. Art. 43.-Notificación de vulneración de seguridad.-El responsable del tratamiento deberá notificar la vulneración de la seguridad de datos personales a la Autoridad de Protección de Datos Personales y la Agencia de Regulación y Control de las Telecomunicaciones, tan pronto sea posible, y a más tardar en el término de cinco (5) días después de que haya tenido constancia de ella, a menos que sea improbable que dicha violación de la seguridad constituya un riesgo para los derechos y las libertades de las personas físicas. Si la notificación a la Autoridad de Protección de Datos no tiene lugar en el término de cinco (5) días, deberá ir acompañada de indicación de los motivos de la dilación. El encargado del tratamiento deberá notificar al responsable cualquier vulneración de la seguridad de datos personales tan pronto sea posible, y a más tardar dentro del término de dos (2) días contados a partir de la fecha en la que tenga conocimiento de ella. Art. 44.-Acceso a datos personales para atención a emergencias e incidentes informáticos.-Las autoridades públicas competentes, los equipos de respuesta de emergencias informáticas, los equipos de respuesta a incidentes de seguridad informática, los centros de operaciones de seguridad, los prestadores y proveedores de servicios de telecomunicaciones y los proveedores de tecnología y servicios de seguridad, nacionales e internacionales, podrán acceder y efectuar tratamientos sobre los datos personales contenidos en las notificaciones de vulneración a las seguridades, durante el tiempo necesario, exclusivamente para la detección, análisis, protección y respuesta ante cualquier tipo de incidentes así como para adoptar e implementar medidas de seguridad adecuadas y proporcionadas a los riesgos identificados. Art. 45.-Garantía del secreto de las comunicaciones y seguridad de datos personales.-Para la correcta prestación de los servicios de telecomunicaciones y la apropiada operación de redes de telecomunicaciones, los prestadores de servicios de telecomunicaciones deben garantizar el secreto de las comunicaciones y seguridad de datos personales. Únicamente por orden judicial, los prestadores de servicios de telecomunicaciones podrán utilizar equipos, infraestructuras e instalaciones que permitan grabar los contenidos de las comunicaciones específicas dispuestas por los jueces competentes. Si se evidencia un tratamiento de grabación o interceptación de las comunicaciones no autorizadas por orden judicial, se aplicará lo dispuesto en la presente Ley. Art. 46.-Notificación de vulneración de seguridad al titular.-El responsable del tratamiento deberá notificar sin dilación la vulneración de seguridad de datos personales al titular cuando conlleve un riesgo a sus derechos fundamentales y libertades individuales, dentro del término de tres días contados a partir de la fecha en la que tuvo conocimiento del riesgo. No se deberá notificar la vulneración de seguridad de datos personales al titular en los siguientes casos: 1. Cuando el responsable del tratamiento haya adoptado medidas de protección técnicas organizativas o de cualquier otra índole apropiadas aplicadas a los datos personales afectados por la vulneración de seguridad que se pueda demostrar que son efectivas; 2. Cuando el responsable del tratamiento haya tomado medidas que garanticen que el riesgo para los derechos fundamentales y las libertades individuales del titular, no ocurrirá; y, LEY ORGÁNICA DE PROTECCIÓN DE DATOS PERSONALES - Página 22 FINDER LOYAL - www.lexis.com.ec 3. Cuando se requiera un esfuerzo desproporcionado para hacerlo; en cuyo caso, el responsable del tratamiento deberá realizar una comunicación pública a través de cualquier medio en la que se informe de la vulneración de seguridad de datos personales a los titulares. La procedencia de las excepciones de les numerales 1 y 2 deberá ser calificada por la Autoridad de Protección de Datos, una vez informada esta tan pronto sea posible, y en cualquier caso dentro de los plazos contemplados en el Artículo 43. La notificación al titular del dato objeto de la vulneración de seguridad contendrá lo señalado en el artículo 43 de esta ley. En caso de que el responsable del tratamiento de los datos personales no cumpliese oportunamente y de modo justificado con la notificación será sancionado conforme al régimen sancionatorio previsto en esta ley. La notificación oportuna de la violación por parte del responsable de tratamiento al titular y la ejecución oportuna de medidas de respuesta, serán consideradas atenuante de la infra (sic)

<https://www.finanzaspopulares.gob.ec/wp-content/uploads/2021/07/ley_organica_de_proteccion_de_datos_personales.pdf>

# Anexo 2.1 SP\_RESULTADO\_ANALISIS (Anexo 4)

USE [BASE\_PROYECTO]

GO

/\*\*\*\*\*\* Object: StoredProcedure [dbo].[SP\_RESULTADO\_ANALISIS] Script Date: 23/10/2024 20:06:22 \*\*\*\*\*\*/

SET ANSI\_NULLS ON

GO

SET QUOTED\_IDENTIFIER ON

GO

ALTER PROCEDURE [dbo].[SP\_RESULTADO\_ANALISIS]

(

@SCORE INT,

@CALIFICACION VARCHAR(16),

@NUMTARJETAS INT,

@PORCENTAJE FLOAT,

@DEUDASFN FLOAT,

@EDADMIN INT,

@EDADMAX INT

)

AS

BEGIN

/\*

SET @SCORE = 500

SET @CALIFICACION = 'AAA,AA,Sin Informacion'

SET @NUMTARJETAS = 2

SET @DEUDASFN = 30000

SET @PORCENTAJE = 0.40

SET @EDADMIN =20

SET @EDADMAX = 60

\*/

-----------------------------

-- CREAMOS ESTRUCTURA Q CONTIENE RESULTADOS

-----------------------------

DROP table IF EXISTS RESTCALIFICACION;

CREATE TABLE RESTCALIFICACION

(

IDENTIFICACION VARCHAR(16),

SCORE INT,

APLICASCORE INT,

CALIFICACION VARCHAR(16),

APLICACALIF INT,

INGRESOMENSUAL FLOAT,

CUOTAMENSUAL FLOAT,

CAPACIDADMENSUAL FLOAT,

APLICACAPPAGO INT,

TIENETJ VARCHAR(16),

APLICATJ INT,

CARTCAST FLOAT,

APLICACARTCAST INT,

APLICADEMJUD INT,

APLICANUMTJS INT,

DEUDASFN FLOAT,

APLICADEUDASFN INT,

EDADSOCIO INT,

APLICAEDAD INT,

)

-----------------------------

-- INSERTAMOS LOS CLIENTES CON EL SCORE DESEADO

-----------------------------

INSERT INTO RESTCALIFICACION(IDENTIFICACION, SCORE, APLICASCORE)

EXEC SP\_SCORE @SCORE

-----------------------------

-- INSERTAMOS CALIFICACION

-----------------------------

/\*

SELECT CALIF,

CASE WHEN CALIF IN (SELECT LTRIM(RTRIM(value)) FROM STRING\_SPLIT('AAA,AA,Sin Informacion', ',')) THEN '1' ELSE '0' END

FROM RESTCALIFICACION R

INNER JOIN BASE\_FINAL B ON R.IDENTIFICACION = B.CI

\*/

UPDATE R

SET CALIFICACION = CALIF,

APLICACALIF = CASE WHEN CALIF IN (SELECT LTRIM(RTRIM(value)) FROM STRING\_SPLIT(@CALIFICACION, ',')) THEN '1' ELSE '0' END

FROM RESTCALIFICACION R

INNER JOIN BASE\_FINAL B ON R.IDENTIFICACION = B.CI

-----------------------------

-- INSERTAMOS TIENE\_TJ

-----------------------------

/\*SELECT TIENE\_TJ,

CASE WHEN TIENE\_TJ = 'SI' THEN '0' ELSE '1' END

FROM RESTCALIFICACION R

INNER JOIN BASE\_FINAL B ON R.IDENTIFICACION = B.CI\*/

UPDATE R

SET TIENETJ = TIENE\_TJ,

APLICATJ = CASE WHEN TIENE\_TJ = 'SI' THEN '0' ELSE '1' END

FROM RESTCALIFICACION R

INNER JOIN BASE\_FINAL B ON R.IDENTIFICACION = B.CI

-----------------------------

-- INSERTAMOS CARTERA CASTIGADA

-----------------------------

/\*SELECT CART\_CAST,

CASE WHEN CART\_CAST > 0 THEN '0' ELSE '1' END

FROM RESTCALIFICACION R

INNER JOIN BASE\_FINAL B ON R.IDENTIFICACION = B.CI\*/

UPDATE R

SET CARTCAST = CART\_CAST,

APLICACARTCAST = CASE WHEN CART\_CAST > 0 THEN '0' ELSE '1' END

FROM RESTCALIFICACION R

INNER JOIN BASE\_FINAL B ON R.IDENTIFICACION = B.CI

-----------------------------

-- INSERTAMOS DEMANDA JUDICIAL

-----------------------------

/\*SELECT DEM\_JUD,

CASE WHEN DEM\_JUD > 0 THEN '0' ELSE '1' END

FROM RESTCALIFICACION R

INNER JOIN BASE\_FINAL B ON R.IDENTIFICACION = B.CI\*/

UPDATE R

SET APLICADEMJUD = CASE WHEN DEM\_JUD > 0 THEN '0' ELSE '1' END

FROM RESTCALIFICACION R

INNER JOIN BASE\_FINAL B ON R.IDENTIFICACION = B.CI

-----------------------------

-- INSERTAMOS NUMERO TARJETAS

-----------------------------

/\*SELECT NUM\_TJS,

CASE WHEN NUM\_TJS > 2 THEN '0' ELSE '1' END

FROM RESTCALIFICACION R

INNER JOIN BASE\_FINAL B ON R.IDENTIFICACION = B.CI\*/

UPDATE R

SET APLICANUMTJS = CASE WHEN NUM\_TJS > @NUMTARJETAS THEN '0' ELSE '1' END

FROM RESTCALIFICACION R

INNER JOIN BASE\_FINAL B ON R.IDENTIFICACION = B.CI

-----------------------------

-- INSERTAMOS DEUDA SISTEMA FINANCIERO

-----------------------------

/\*SELECT DEUDA\_SFN,

CASE WHEN DEUDA\_SFN > 30000 THEN '0' ELSE '1' END

FROM RESTCALIFICACION R

INNER JOIN BASE\_FINAL B ON R.IDENTIFICACION = B.CI\*/

UPDATE R

SET DEUDASFN = DEUDA\_SFN,

APLICADEUDASFN = CASE WHEN DEUDA\_SFN > @DEUDASFN THEN '0' ELSE '1' END

FROM RESTCALIFICACION R

INNER JOIN BASE\_FINAL B ON R.IDENTIFICACION = B.CI

-----------------------------

-- INSERTAMOS EDAD

-----------------------------

/\*SELECT EDAD,

CASE WHEN EDAD BETWEEN 31 AND 60 THEN '1' ELSE '0' END

FROM RESTCALIFICACION R

INNER JOIN BASE\_FINAL B ON R.IDENTIFICACION = B.CI\*/

UPDATE R

SET EDADSOCIO = EDAD,

APLICAEDAD = CASE WHEN EDAD BETWEEN @EDADMIN AND @EDADMAX THEN '1' ELSE '0' END

FROM RESTCALIFICACION R

INNER JOIN BASE\_FINAL B ON R.IDENTIFICACION = B.CI

-----------------------------

-- INSERTAMOS CAPACIDAD DE PAGO (ESTA MAL)

-----------------------------

UPDATE R

SET INGRESOMENSUAL = B.ING\_DIST,

CUOTAMENSUAL = B.CUOTA\_MENS,

CAPACIDADMENSUAL = CASE WHEN (ING\_DIST - CUOTA\_MENS) \* @PORCENTAJE <= 0 THEN 0 ELSE (ING\_DIST - CUOTA\_MENS) \* @PORCENTAJE END,

APLICACAPPAGO = CASE WHEN (ING\_DIST - CUOTA\_MENS) \* @PORCENTAJE <= 0 THEN 0 ELSE 1 END

FROM RESTCALIFICACION R

INNER JOIN BASE\_FINAL B ON R.IDENTIFICACION = B.CI

/\*

SELECT

B.ING\_DIST,

B.CUOTA\_MENS,

CASE WHEN (ING\_DIST - CUOTA\_MENS) \* 0.40 < 0 THEN 0 ELSE (ING\_DIST - CUOTA\_MENS) \* 0.40 END AS RESULTADO,

CASE WHEN (ING\_DIST - CUOTA\_MENS) \* 0.40 < 0 THEN 0 ELSE 1 END AS RESULTADO2

FROM RESTCALIFICACION R

INNER JOIN BASE\_FINAL B ON R.IDENTIFICACION = B.CI

\*/

SELECT\* FROM RESTCALIFICACION

WHERE APLICACALIF = 1

AND APLICASCORE = 1

AND APLICACAPPAGO = 1

AND APLICACARTCAST = 1

AND APLICADEMJUD = 1

AND APLICAEDAD = 1

AND APLICANUMTJS = 1

AND APLICATJ = 1

END

# Anexo 2.2 SP\_CALCULOCUPOS (Anexo 5)

USE BASE\_PROYECTO

GO

CREATE PROCEDURE SP\_CALCULACUPOS

(

@Start INT,

@Max INT

)

AS

BEGIN

IF EXISTS (SELECT \* FROM sys.objects WHERE object\_id = OBJECT\_ID(N'MATRIZ\_PAGOS') AND type = N'U')

DROP TABLE MATRIZ\_PAGOS;

create table MATRIZ\_PAGOS

(

Id INT IDENTITY,

Cupo decimal(16,2),

Plazo24 int,

Resultado24 decimal(16,2),

Plazo36 int,

Resultado36 decimal(16,2)

)

declare @tasa float

--DECLARE @Start INT = 5000;

--DECLARE @Max INT = 1000;

select @tasa = valorfloat/ 100 from parametros

select @tasa = @tasa/12;

WHILE @Max <= @Start

BEGIN

-- Realiza la acción que necesites aquí

insert into MATRIZ\_PAGOS

values(@Start, 24, dbo.PagoMensualCredito(@tasa, 24, @Start), 36, dbo.PagoMensualCredito(@tasa, 36, @Start))

SET @Start = @Start - 1000;

END;

insert into MATRIZ\_PAGOS

values(500, 24, dbo.PagoMensualCredito(@tasa, 24, 500), 36, dbo.PagoMensualCredito(@tasa, 36, 500))

insert into MATRIZ\_PAGOS

values(300, 24, dbo.PagoMensualCredito(@tasa, 24, 300), 36, dbo.PagoMensualCredito(@tasa, 36, 300))

DECLARE @INI INT = 1;

DECLARE @SIG INT = 2;

DECLARE @TOTAL INT = 0;

DECLARE @CUPOMAYOR FLOAT

DECLARE @CUPOMENOR FLOAT

SELECT @TOTAL = COUNT(1) FROM MATRIZ\_PAGOS

WHILE @SIG <= @TOTAL

BEGIN

-- Realiza la acción que necesites aquí

SELECT @CUPOMAYOR = Resultado24

FROM MATRIZ\_PAGOS

WHERE Id = @INI

SELECT @CUPOMENOR = Resultado24

FROM MATRIZ\_PAGOS

WHERE Id = @SIG

IF(@INI = 1 )

BEGIN

UPDATE R

SET R.CUPOASIGNADO = (SELECT CUPO

FROM MATRIZ\_PAGOS

WHERE Id = @INI)

FROM RESTCALIFICACION R

WHERE R.CAPACIDADMENSUAL >= @CUPOMAYOR

END

UPDATE R

SET R.CUPOASIGNADO = (SELECT CUPO

FROM MATRIZ\_PAGOS

WHERE Id = @SIG)

FROM RESTCALIFICACION R

WHERE R.CAPACIDADMENSUAL >= @CUPOMENOR

AND R.CAPACIDADMENSUAL <= @CUPOMAYOR

IF(@SIG = @TOTAL )

BEGIN

UPDATE R

SET R.CUPOASIGNADO = 0

FROM RESTCALIFICACION R

WHERE R.CAPACIDADMENSUAL < @CUPOMENOR

END

SET @INI = @SIG;

SET @SIG = @SIG + 1;

END;

IF EXISTS (SELECT \* FROM sys.objects WHERE object\_id = OBJECT\_ID(N'BASE\_APLICA') AND type = N'U')

DROP TABLE BASE\_APLICA;

SELECT \*

INTO BASE\_APLICA

FROM RESTCALIFICACION

WHERE APLICACALIF = 1

AND APLICASCORE = 1

AND APLICACAPPAGO = 1

AND APLICACARTCAST = 1

AND APLICADEMJUD = 1

AND APLICAEDAD = 1

AND APLICANUMTJS = 1

AND APLICATJ = 1

SELECT \* FROM BASE\_APLICA

END

# Anexo 3.1 SCRIPT CÁLCULOS R (Anexo 6)

> nombres\_columnas <- c("IDENTIFICACION","SCORE","APLICASCORE","CALIFICACION","APLICACALIF","INGRESOMENSUAL","CUOTAMENSUAL","CAPACIDADMENSUAL","APLICACAPPAGO","TIENETJ","APLICATJ","CARTCAST","APLICACARTCAST","APLICADEMJUD","APLICANUMTJS","DEUDASFN","APLICADEUDASFN","EDADSOCIO","APLICAEDAD","CUPOASIGNADO")

> datos <- read.csv ("C:/Users/danie/Desktop/PROYECTO MASTER/VISUALIZACION/BASE\_RESTCALIFICACION.csv", header= FALSE, col.names = nombres\_columnas, sep = ";")

> datos$SCORE <- as.integer(datos$SCORE)

Aviso:

NAs introducidos por coerción

> datos$APLICACALIF <- as.integer(datos$APLICACALIF)

Aviso:

NAs introducidos por coerción

> datos$INGRESOMENSUAL <- as.numeric(datos$INGRESOMENSUAL)

Aviso:

NAs introducidos por coerción

> datos$CUOTAMENSUAL <- as.numeric(datos$CUOTAMENSUAL)

Aviso:

NAs introducidos por coerción

> datos$CAPACIDADMENSUAL <- as.numeric(datos$CAPACIDADMENSUAL)

Aviso:

NAs introducidos por coerción

> datos$APLICACAPPAGO <- as.integer(datos$APLICACAPPAGO)

Aviso:

NAs introducidos por coerción

> datos$APLICATJ <- as.integer(datos$APLICATJ)

Aviso:

NAs introducidos por coerción

> datos$APLICACARTCAST <- as.integer(datos$APLICACARTCAST)

Aviso:

NAs introducidos por coerción

> datos$APLICADEMJUD <- as.integer(datos$APLICADEMJUD)

Aviso:

NAs introducidos por coerción

> datos$APLICANUMTJS <- as.integer(datos$APLICANUMTJ)

Aviso:

NAs introducidos por coerción

> datos$DEUDASFN <- as.numeric(datos$DEUDASFN)

Aviso:

NAs introducidos por coerción

> datos$APLICADEUDASFN <- as.integer(datos$APLICADEUDASFN)

Aviso:

NAs introducidos por coerción

> datos$EDADSOCIO <- as.integer(datos$EDADSOCIO)

Aviso:

NAs introducidos por coerción

> datos$APLICAEDAD <- as.integer(datos$APLICAEDAD)

Aviso:

NAs introducidos por coerción

> datos$CUPOASIGNADO <- as.numeric(datos$CUPOASIGNADO)

Aviso:

NAs introducidos por coerción

>

> datos[is.na(datos)] <- 0

> sapply(datos, function(x) sum(is.na(x)))

IDENTIFICACION SCORE APLICASCORE CALIFICACION APLICACALIF INGRESOMENSUAL CUOTAMENSUAL CAPACIDADMENSUAL APLICACAPPAGO

0 0 0 0 0 0 0 0 0

TIENETJ APLICATJ CARTCAST APLICACARTCAST APLICADEMJUD APLICANUMTJS DEUDASFN APLICADEUDASFN EDADSOCIO

0 0 0 0 0 0 0 0 0

APLICAEDAD CUPOASIGNADO

0 0

>

> datosa <- datos[datos$APLICASCORE == 1 & datos$APLICACALIF == 1 & datos$APLICACAPPAGO == 1 & datos$APLICATJ == 1 & datos$APLICACARTCAST == 1 & datos$APLICADEMJUD == 1 & datos$APLICANUMTJS == 1 & datos$APLICADEUDASFN == 1 & datos$APLICAEDAD == 1, ]

> summary(datosa)

IDENTIFICACION SCORE APLICASCORE CALIFICACION APLICACALIF INGRESOMENSUAL CUOTAMENSUAL CAPACIDADMENSUAL APLICACAPPAGO

Length:5038 Min. :898.0 Min. :1 Length:5038 Min. :1 Min. : 460 Min. : 0.000 Min. : 0.0 Min. :1

Class :character 1st Qu.:957.0 1st Qu.:1 Class :character 1st Qu.:1 1st Qu.: 986 1st Qu.: 0.000 1st Qu.: 0.0 1st Qu.:1

Mode :character Median :962.0 Median :1 Mode :character Median :1 Median : 986 Median : 0.000 Median : 0.0 Median :1

Mean :961.6 Mean :1 Mean :1 Mean :1126 Mean : 5.095 Mean : 10.8 Mean :1

3rd Qu.:967.0 3rd Qu.:1 3rd Qu.:1 3rd Qu.:1212 3rd Qu.: 0.000 3rd Qu.: 0.0 3rd Qu.:1

Max. :981.0 Max. :1 Max. :1 Max. :2200 Max. :893.000 Max. :704.0 Max. :1

TIENETJ APLICATJ CARTCAST APLICACARTCAST APLICADEMJUD APLICANUMTJS DEUDASFN APLICADEUDASFN EDADSOCIO APLICAEDAD

Length:5038 Min. :1 Length:5038 Min. :1 Min. :1 Min. :1 Min. : 0.0 Min. :1 Min. :31.00 Min. :1

Class :character 1st Qu.:1 Class :character 1st Qu.:1 1st Qu.:1 1st Qu.:1 1st Qu.: 0.0 1st Qu.:1 1st Qu.:40.00 1st Qu.:1

Mode :character Median :1 Mode :character Median :1 Median :1 Median :1 Median : 0.0 Median :1 Median :48.00 Median :1

Mean :1 Mean :1 Mean :1 Mean :1 Mean : 364.1 Mean :1 Mean :47.22 Mean :1

3rd Qu.:1 3rd Qu.:1 3rd Qu.:1 3rd Qu.:1 3rd Qu.: 0.0 3rd Qu.:1 3rd Qu.:54.00 3rd Qu.:1

Max. :1 Max. :1 Max. :1 Max. :1 Max. :30000.0 Max. :1 Max. :60.00 Max. :1

CUPOASIGNADO

Min. : 0

1st Qu.:4000

Median :5000

Mean :4224

3rd Qu.:5000

Max. :5000

>

> datos\_num <- datosa[sapply(datosa, is.numeric)]

> correlaciones <- cor(datos\_num)

Aviso:

In cor(datos\_num) : La desviación estándar es cero

> print(correlaciones)

SCORE APLICASCORE APLICACALIF INGRESOMENSUAL CUOTAMENSUAL CAPACIDADMENSUAL APLICACAPPAGO APLICATJ APLICACARTCAST APLICADEMJUD

SCORE 1.00000000 NA NA -0.058344355 -0.008170340 0.11829510 NA NA NA NA

APLICASCORE NA 1 NA NA NA NA NA NA NA NA

APLICACALIF NA NA 1 NA NA NA NA NA NA NA

INGRESOMENSUAL -0.05834435 NA NA 1.000000000 0.001750093 0.08726699 NA NA NA NA

CUOTAMENSUAL -0.00817034 NA NA 0.001750093 1.000000000 0.09006361 NA NA NA NA

CAPACIDADMENSUAL 0.11829510 NA NA 0.087266992 0.090063605 1.00000000 NA NA NA NA

APLICACAPPAGO NA NA NA NA NA NA 1 NA NA NA

APLICATJ NA NA NA NA NA NA NA 1 NA NA

APLICACARTCAST NA NA NA NA NA NA NA NA 1 NA

APLICADEMJUD NA NA NA NA NA NA NA NA NA 1

APLICANUMTJS NA NA NA NA NA NA NA NA NA NA

DEUDASFN -0.03661948 NA NA 0.012951098 0.018580902 -0.01951518 NA NA NA NA

APLICADEUDASFN NA NA NA NA NA NA NA NA NA NA

EDADSOCIO 0.00678420 NA NA 0.373589660 0.011030045 0.06544364 NA NA NA NA

APLICAEDAD NA NA NA NA NA NA NA NA NA NA

CUPOASIGNADO 0.28277969 NA NA 0.353151788 0.001161517 0.08340930 NA NA NA NA

APLICANUMTJS DEUDASFN APLICADEUDASFN EDADSOCIO APLICAEDAD CUPOASIGNADO

SCORE NA -0.036619476 NA 0.006784200 NA 0.282779692

APLICASCORE NA NA NA NA NA NA

APLICACALIF NA NA NA NA NA NA

INGRESOMENSUAL NA 0.012951098 NA 0.373589660 NA 0.353151788

CUOTAMENSUAL NA 0.018580902 NA 0.011030045 NA 0.001161517

CAPACIDADMENSUAL NA -0.019515182 NA 0.065443642 NA 0.083409299

APLICACAPPAGO NA NA NA NA NA NA

APLICATJ NA NA NA NA NA NA

APLICACARTCAST NA NA NA NA NA NA

APLICADEMJUD NA NA NA NA NA NA

APLICANUMTJS 1 NA NA NA NA NA

DEUDASFN NA 1.000000000 NA 0.002364546 NA -0.035994106

APLICADEUDASFN NA NA 1 NA NA NA

EDADSOCIO NA 0.002364546 NA 1.000000000 NA 0.118237591

APLICAEDAD NA NA NA NA 1 NA

CUPOASIGNADO NA -0.035994106 NA 0.118237591 NA 1.000000000

>

>

> cor.test(datosa$CUPOASIGNADO, datosa$CAPACIDADMENSUAL)

Pearson's product-moment correlation

data: datosa$CUPOASIGNADO and datosa$CAPACIDADMENSUAL

t = 5.9398, df = 5036, p-value = 3.045e-09

alternative hypothesis: true correlation is not equal to 0

95 percent confidence interval:

0.05592356 0.11076871

sample estimates:

cor

0.0834093

> plot(datosa$CUPOASIGNADO, datosa$CAPACIDADMENSUAL, xlim = c(0,50), ylim=c(0,50), xlab = "CUPO ASIGNADO", ylab = "CAPACIDAD MENSUAL", pch=20)

>

>

> modeloregresionlineal <- lm(CUPOASIGNADO ~ CAPACIDADMENSUAL + INGRESOMENSUAL + CUOTAMENSUAL + SCORE + DEUDASFN + EDADSOCIO, data = datosa)

> modeloregresionlineal

Call:

lm(formula = CUPOASIGNADO ~ CAPACIDADMENSUAL + INGRESOMENSUAL +

CUOTAMENSUAL + SCORE + DEUDASFN + EDADSOCIO, data = datosa)

Coefficients:

(Intercept) CAPACIDADMENSUAL INGRESOMENSUAL CUOTAMENSUAL SCORE DEUDASFN EDADSOCIO

-2.973e+04 2.700e-01 1.578e+00 7.853e-02 3.367e+01 -1.577e-02 -4.148e+00

> anovarl <- aov(modeloregresionlineal)

> summary(anovarl)

Df Sum Sq Mean Sq F value Pr(>F)

CAPACIDADMENSUAL 1 5.696e+07 56955919 44.804 2.42e-11 \*\*\*

INGRESOMENSUAL 1 9.869e+08 986877065 776.313 < 2e-16 \*\*\*

CUOTAMENSUAL 1 1.471e+05 147081 0.116 0.7338

SCORE 1 7.350e+08 735045285 578.213 < 2e-16 \*\*\*

DEUDASFN 1 7.107e+06 7107150 5.591 0.0181 \*

EDADSOCIO 1 4.997e+06 4996909 3.931 0.0475 \*

Residuals 5031 6.396e+09 1271236

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

>

>

> library(rpart)

> modeloarbol <- rpart(CUPOASIGNADO ~ ., data = datosa)

> modeloarbol

n= 5038

node), split, n, deviance, yval

\* denotes terminal node

1) root 5038 8186720000 4223.6600

2) 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11) IDENTIFICACION=000025,000186,000195,000316,000363,000488,000512,000658,000691,000714,000903,000964,001307,001378,001563,001651,001741,001881,001928,001939,001995,002009,002040,002057,002313,002410,002509,002667,002669,002682,002893,002959,003124,003157,003174,003179,003207,003319,003345,003476,003508,003635,003670,003675,003761,003843,003910,003948,004080,004095,004192,004234,004325,004514,004522,004523,004688,004711,004786,004834,004905,004915,004964,004981,005017,005018,005026,005051,005059,005318,005419,005463,005487,005594,005628,005633,005696,005738,005761,005800,005829,005935,005979,006018,006131,006139,006153,006174,006332,006344,006378,006458,006537,006611,006689,006693,006732,006865,006959,006962,007007,007050,007051,007065,007147,007517,007568,007607,007612,007647,007648,007762,007804,007826,007853,007856,007858,007914,007935,007942,007992,008029,008062,008093,008235,008260,008269,008382,008452,008469,008668,008727,008735,008858,008865,008871,008905,008939,008955,008990,009038,009122,009143,009152,009183,009184,009253,009259,009336,009367,009411,009519,009564,009669,009715,009888,010029,010037,010053,010060,010068,010162,010187,010243,010244,010321,010442,010462,010508,010527,010530,010543,010728,010806,010884,010915,010986,011039,011089,011106,011178,011180,011188,011425,011483,011525,011639,011644,011672,011697,011834,011841,011884,011966,012028,012032,012049,012081,012098,012289,012355,012396,012515,012533,012542,012572,012776,012798,012802,012808,012958,012991,013075,013082,013186,013264,013271,013316,013320,013330,013368,013376,013393,013421,013441,013457,013535,013745,013762,013794,013827,013864,013883,014078,014104,014248,014372,014433,014477,014557,014563,014568,014604,014628,014853,014870,014880,014963,015003,015027,015140,015198,015342,015385,015434,015546,015679,015756,015799,015984,016010,016187,016268,016315,016328,016363,016365,016428,016484,016489,016591,016605,016612,016635,016682,016701,016721,016726,016742,016752,016834,016874,016876,016880,016971,017051,017063,017102,017109,017181,017190,017283,017322,017336,017349,017353,017451,017517,017710,017785,017997,018014,018063,018126,018190,018207,018320,018364,018365,018394,018463,018520,018626,018632,018643,018644,018741,018875,018877,018893,018962,019011,019132,019134,019148,019177,019274,019275,019326,019380,019437,019469,019514,019572,019614,019642,019673,019769,019858,019886,019961,019982,020099,020164,020201,020220,020262,020385,020441,020450,020464,020479,020565,020676,020681,020716,020760,020780,020825,021004,021016,021065,021177,021259,021294,021317,021444,021618,021706,021719,021806,021819,021823,021842,021906,021945,022008,022018,022031,022102,022250,022303,022424,022427,022481,022522,022597,022614,022639,022722,022793,022802,023011,023043,023160,023192,023217,023415,023487,023496,023532,023578,023710,023726,023742,023755,023766,023783,023826,023859,023886,023939,023958,024002,024026,024046,024298,024323,024388,024426,024546,024593,024598,024629,024851,024883,024949,024979,025121,025308,025457,025654,025738,025752,025811,025861,025883,025888,025902,025905,025980,026153,026200,026229,026243,026341,026365,026482,026594,026606,026667,026734,026755,027169,027254,027272,027333,027351,027401,027569,027575,027585,027598,027619,027635,027720,027776,027800,027872,027888,027990,028045,028078,028085,028090,028138,028258,028278,028443,028465 480 0 3000.0000 \*

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024955,024971,024973,024998,025003,025017,025024,025029,025048,025055,025060,025062,025078,025079,025084,025093,025098,025102,025115,025123,025126,025148,025152,025154,025163,025174,025189,025207,025208,025218,025221,025223,025226,025233,025240,025241,025242,025245,025256,025268,025284,025289,025290,025293,025298,025309,025310,025313,025324,025340,025350,025351,025356,025385,025390,025402,025403,025417,025418,025419,025443,025445,025454,025455,025462,025465,025478,025487,025496,025497,025501,025507,025532,025533,025537,025539,025595,025596,025602,025623,025629,025638,025640,025647,025652,025658,025659,025682,025687,025690,025691,025696,025717,025719,025722,025724,025733,025736,025740,025743,025744,025759,025760,025774,025780,025784,025787,025795,025801,025809,025813,025818,025856,025858,025859,025866,025869,025898,025906,025914,025918,025921,025939,025944,025947,025954,025958,025978,025985,025987,025988,026009,026030,026038,026042,026044,026061,026065,026072,026087,026094,026095,026107,026122,026125,026151,026171,026184,026186,026187,026193,026196,026230,026241,026253,026254,026262,026265,026267,026277,026283,026284,026285,026286,026293,026309,026319,026322,026323,026326,026328,026333,026349,026358,026360,026362,026363,026366,026369,026376,026397,026401,026408,026418,026423,026445,026451,026464,026469,026476,026486,026500,026503,026507,026526,026537,026548,026552,026553,026578,026582,026608,026610,026616,026632,026634,026650,026651,026676,026688,026692,026695,026699,026700,026702,026714,026718,026721,026722,026770,026785,026789,026792,026805,026833,026835,026845,026857,026860,026863,026878,026894,026900,026913,026927,026953,026970,026974,026984,026995,027004,027006,027008,027018,027024,027032,027047,027051,027055,027074,027075,027076,027078,027084,027089,027094,027096,027103,027121,027126,027137,027139,027144,027150,027162,027165,027167,027172,027188,027193,027197,027206,027209,027211,027216,027226,027231,027250,027264,027268,027313,027315,027337,027348,027353,027357,027372,027394,027396,027400,027407,027410,027424,027426,027433,027434,027443,027446,027448,027465,027472,027474,027477,027491,027495,027499,027500,027513,027519,027521,027523,027533,027567,027572,027590,027604,027612,027636,027666,027674,027682,027694,027696,027710,027714,027721,027726,027732,027741,027743,027754,027764,027769,027796,027829,027830,027833,027837,027841,027851,027855,027864,027871,027883,027886,027887,027914,027916,027927,027931,027933,027937,027946,027947,027959,027968,027974,027981,027995,028000,028005,028024,028026,028047,028079,028080,028092,028095,028101,028105,028114,028126,028132,028142,028149,028153,028155,028158,028173,028179,028182,028196,028199,028201,028215,028253,028260,028268,028271,028274,028275,028283,028291,028313,028320,028324,028327,028330,028354,028359,028366,028372,028377,028379,028385,028395,028398,028404,028414,028424,028429,028447,028448,028464,028466,028479,028486,028491,028492,028497,028507,028522,028532,028542,028543,028555 3281 0 5000.0000 \*

>

>

> set.seed(123)

> library(caret)

Error en library(caret): no hay paquete llamado ‘caret’

>

> install.packages("caret")

Installing package into ‘C:/Users/danie/AppData/Local/R/win-library/4.4’

(as ‘lib’ is unspecified)

--- Please select a CRAN mirror for use in this session ---

also installing the dependencies ‘listenv’, ‘parallelly’, ‘future’, ‘globals’, ‘shape’, ‘future.apply’, ‘numDeriv’, ‘progressr’, ‘SQUAREM’, ‘diagram’, ‘lava’, ‘tzdb’, ‘cpp11’, ‘prodlim’, ‘timechange’, ‘data.table’, ‘clock’, ‘gower’, ‘hardhat’, ‘ipred’, ‘lubridate’, ‘purrr’, ‘tidyr’, ‘timeDate’, ‘e1071’, ‘ModelMetrics’, ‘pROC’, ‘recipes’

There is a binary version available but the source version is later:

binary source needs\_compilation

future.apply 1.11.2 1.11.3 FALSE

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/listenv\_0.9.1.zip'

Content type 'application/zip' length 109327 bytes (106 KB)

downloaded 106 KB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/parallelly\_1.38.0.zip'

Content type 'application/zip' length 383177 bytes (374 KB)

downloaded 374 KB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/future\_1.34.0.zip'

Content type 'application/zip' length 690436 bytes (674 KB)

downloaded 674 KB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/globals\_0.16.3.zip'

Content type 'application/zip' length 109926 bytes (107 KB)

downloaded 107 KB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/shape\_1.4.6.1.zip'

Content type 'application/zip' length 753988 bytes (736 KB)

downloaded 736 KB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/numDeriv\_2016.8-1.1.zip'

Content type 'application/zip' length 117304 bytes (114 KB)

downloaded 114 KB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/progressr\_0.14.0.zip'

Content type 'application/zip' length 391745 bytes (382 KB)

downloaded 382 KB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/SQUAREM\_2021.1.zip'

Content type 'application/zip' length 183502 bytes (179 KB)

downloaded 179 KB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/diagram\_1.6.5.zip'

Content type 'application/zip' length 688009 bytes (671 KB)

downloaded 671 KB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/lava\_1.8.0.zip'

Content type 'application/zip' length 2506213 bytes (2.4 MB)

downloaded 2.4 MB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/tzdb\_0.4.0.zip'

Content type 'application/zip' length 1016530 bytes (992 KB)

downloaded 992 KB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/cpp11\_0.5.0.zip'

Content type 'application/zip' length 294248 bytes (287 KB)

downloaded 287 KB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/prodlim\_2024.06.25.zip'

Content type 'application/zip' length 423366 bytes (413 KB)

downloaded 413 KB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/timechange\_0.3.0.zip'

Content type 'application/zip' length 513499 bytes (501 KB)

downloaded 501 KB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/data.table\_1.16.2.zip'

Content type 'application/zip' length 2663480 bytes (2.5 MB)

downloaded 2.5 MB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/clock\_0.7.1.zip'

Content type 'application/zip' length 2206741 bytes (2.1 MB)

downloaded 2.1 MB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/gower\_1.0.1.zip'

Content type 'application/zip' length 325167 bytes (317 KB)

downloaded 317 KB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/hardhat\_1.4.0.zip'

Content type 'application/zip' length 847839 bytes (827 KB)

downloaded 827 KB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/ipred\_0.9-15.zip'

Content type 'application/zip' length 391930 bytes (382 KB)

downloaded 382 KB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/lubridate\_1.9.3.zip'

Content type 'application/zip' length 987196 bytes (964 KB)

downloaded 964 KB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/purrr\_1.0.2.zip'

Content type 'application/zip' length 509705 bytes (497 KB)

downloaded 497 KB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/tidyr\_1.3.1.zip'

Content type 'application/zip' length 1270347 bytes (1.2 MB)

downloaded 1.2 MB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/timeDate\_4041.110.zip'

Content type 'application/zip' length 1402598 bytes (1.3 MB)

downloaded 1.3 MB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/e1071\_1.7-16.zip'

Content type 'application/zip' length 672335 bytes (656 KB)

downloaded 656 KB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/ModelMetrics\_1.2.2.2.zip'

Content type 'application/zip' length 479901 bytes (468 KB)

downloaded 468 KB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/pROC\_1.18.5.zip'

Content type 'application/zip' length 1168755 bytes (1.1 MB)

downloaded 1.1 MB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/recipes\_1.1.0.zip'

Content type 'application/zip' length 1666790 bytes (1.6 MB)

downloaded 1.6 MB

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/caret\_6.0-94.zip'

Content type 'application/zip' length 3599985 bytes (3.4 MB)

downloaded 3.4 MB

package ‘listenv’ successfully unpacked and MD5 sums checked

package ‘parallelly’ successfully unpacked and MD5 sums checked

package ‘future’ successfully unpacked and MD5 sums checked

package ‘globals’ successfully unpacked and MD5 sums checked

package ‘shape’ successfully unpacked and MD5 sums checked

package ‘numDeriv’ successfully unpacked and MD5 sums checked

package ‘progressr’ successfully unpacked and MD5 sums checked

package ‘SQUAREM’ successfully unpacked and MD5 sums checked

package ‘diagram’ successfully unpacked and MD5 sums checked

package ‘lava’ successfully unpacked and MD5 sums checked

package ‘tzdb’ successfully unpacked and MD5 sums checked

package ‘cpp11’ successfully unpacked and MD5 sums checked

package ‘prodlim’ successfully unpacked and MD5 sums checked

package ‘timechange’ successfully unpacked and MD5 sums checked

package ‘data.table’ successfully unpacked and MD5 sums checked

package ‘clock’ successfully unpacked and MD5 sums checked

package ‘gower’ successfully unpacked and MD5 sums checked

package ‘hardhat’ successfully unpacked and MD5 sums checked

package ‘ipred’ successfully unpacked and MD5 sums checked

package ‘lubridate’ successfully unpacked and MD5 sums checked

package ‘purrr’ successfully unpacked and MD5 sums checked

package ‘tidyr’ successfully unpacked and MD5 sums checked

package ‘timeDate’ successfully unpacked and MD5 sums checked

package ‘e1071’ successfully unpacked and MD5 sums checked

package ‘ModelMetrics’ successfully unpacked and MD5 sums checked

package ‘pROC’ successfully unpacked and MD5 sums checked

package ‘recipes’ successfully unpacked and MD5 sums checked

package ‘caret’ successfully unpacked and MD5 sums checked

The downloaded binary packages are in

C:\Users\danie\AppData\Local\Temp\RtmpQlX0t0\downloaded\_packages

installing the source package ‘future.apply’

probando la URL 'https://mirror.cedia.org.ec/CRAN/src/contrib/future.apply\_1.11.3.tar.gz'

Content type 'application/octet-stream' length 60355 bytes (58 KB)

downloaded 58 KB

\* installing \*source\* package 'future.apply' ...

\*\* package 'future.apply' successfully unpacked and MD5 sums checked

\*\* using staged installation

\*\* R

\*\* inst

\*\* byte-compile and prepare package for lazy loading

\*\* help

\*\*\* installing help indices

\*\* building package indices

\*\* installing vignettes

\*\* testing if installed package can be loaded from temporary location

\*\* testing if installed package can be loaded from final location

\*\* testing if installed package keeps a record of temporary installation path

\* DONE (future.apply)

The downloaded source packages are in

‘C:\Users\danie\AppData\Local\Temp\RtmpQlX0t0\downloaded\_packages’

>

> library(caret)

Cargando paquete requerido: ggplot2

Cargando paquete requerido: lattice

> index <- createDataPartition(datosa$CUPOASIGNADO, p = 0.8, list = FALSE)

> train\_data <- datosa[index, ]

> test\_data <- datosa[-index, ]

>

> modelo\_lineal <- lm(CUPOASIGNADO ~ ., data = train\_data)

Error en `contrasts<-`(`\*tmp\*`, value = contr.funs[1 + isOF[nn]]):

contrasts can be applied only to factors with 2 or more levels

>

> modelo\_lineal <- lm(CUPOASIGNADO ~ CAPACIDADMENSUAL + INGRESOMENSUAL + CUOTAMENSUAL + SCORE + DEUDASFN + EDADSOCIO, data = train\_data)

>

> modelo\_arbol <- rpart(CUPOASIGNADO ~ CAPACIDADMENSUAL + INGRESOMENSUAL + CUOTAMENSUAL + SCORE + DEUDASFN + EDADSOCIO, data = train\_data)

>

> pred\_lineal <- predict(modelo\_lineal, newdata = test\_data)

>

> pred\_arbol <- predict(modelo\_arbol, newdata = test\_data)

>

> library(Metrics)

Error en library(Metrics): no hay paquete llamado ‘Metrics’

>

> install.packages("Metrics")

Installing package into ‘C:/Users/danie/AppData/Local/R/win-library/4.4’

(as ‘lib’ is unspecified)

probando la URL 'https://mirror.cedia.org.ec/CRAN/bin/windows/contrib/4.4/Metrics\_0.1.4.zip'

Content type 'application/zip' length 85995 bytes (83 KB)

downloaded 83 KB

package ‘Metrics’ successfully unpacked and MD5 sums checked

The downloaded binary packages are in

C:\Users\danie\AppData\Local\Temp\RtmpQlX0t0\downloaded\_packages

>

> library(Metrics)

Adjuntando el paquete: ‘Metrics’

The following objects are masked from ‘package:caret’:

precision, recall

> mse\_lineal <- mse(test\_data$CUPOASIGNADO, pred\_lineal)

> mse\_arbol <- mse(test\_data$CUPOASIGNADO, pred\_arbol)

>

> print(paste("MSE Regresión Lineal:", mse\_lineal))

[1] "MSE Regresión Lineal: 1223171.55469735"

> print(paste("MSE Árbol de Regresión:", mse\_arbol))

[1] "MSE Árbol de Regresión: 1116211.30064137"

>

>

> dev.new()

> boxplot(CUPOASIGNADO ~ EDADSOCIO, data = datosa)

>

>

> dev.off()

windows

2

> plot(datosa$CAPACIDADMENSUAL, datosa$CUPOASIGNADO, main = "Relación entre Capacidad Mensual y Cupo Asignado", xlab = "Capacidad Mensual", ylab = "Cupo Asignado", col = "blue")

>

> dev.off()

null device

1

> plot(datosa$CAPACIDADMENSUAL, datosa$CUPOASIGNADO)

>

> dev.new()

> plot(datosa$CAPACIDADMENSUAL, datosa$CUPOASIGNADO, main = "Relación entre Capacidad Mensual y Cupo Asignado", xlab = "Capacidad Mensual", ylab = "Cupo Asignado", col = "blue")

>