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ACTEX Study Manual for
CAS Exam 6 U.S.

Fall 2018 Edition

Volume I

Victoria Grossack, FCAS

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ACTEX Learning
New Hartford, Connecticut

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ISBN: 978-1-63588-515-6

Printed in the United States of America.

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C. FINANCIAL REPORTING AND TAXATION

Notes on Past Exam Questions and Answers

Questions and parts of some solutions have been taken from material copyrighted by the Casualty Actuarial Society. They are reproduced in this study manual with the permission of the CAS solely to aid students studying for the actuarial exams. Some editing of questions has been done. Students may also request past exams directly from the society. I am very grateful to the CAS for its cooperation and permission to use this material. It is, of course, in no way responsible for the structure or accuracy of the manual.

Readings are outlined, with the exception of some tables and spreadsheets. These, however, usually have questions based on them to aid with study. The readings are organized, more or less, by learning objective. The exams themselves usually follow this organization, with questions from learning objective A coming first.

Exam questions are identified by numbers in parentheses at the end of each question. CAS questions have four numbers separated by hyphens: the year of the exam, the number of the exam, the number of the question, and the points assigned. A few recent exam questions were based on several readings but were only included after one of the readings. For those readings with no or few appropriate exam questions, review questions were created to aid students, numbered R1, R2, and so on.

An attempt has been made to clean up irrelevant and redundant questions and answers. I have made a conscientious effort to eliminate mistakes and incorrect answers, but I am certain some remain. I encourage students who find errors to bring them to my attention. Please check our website for corrections subsequent to publication.

♦ ♦ ♦

I would like to thank Peter J. Murdza and Dean A. Westpfahl for their contributions to this manual, which include many summary outlines and past examination answers.

To the students who make use of this manual, feedback is welcome. Good luck on October 23, 2018!

VAG

Jeff Kucera, "NAIC Public Hearing on Credit-Based Insurance Scores," April 30, 2009, American Academy of Actuaries

OUTLINE

I. INTRODUCTION

A. Overview

1. Scores allows better segmentation of insurance risks
2. Most companies use for PPA and HO
3. Better matches premiums and risks' costs
4. Prohibition of the use of scores will not affect overall premium but rather its distribution among risks

B. Current Economic Circumstances

1. Current economic crisis includes severe tightening of credit markets
2. Economic problems raise questions of use of credit rating in insurance

II. ISSUES IDENTIFIED BY THE NAIC

A. Definition of What Constitute a Credit-Based Score

1. **Insurance score** – "numerical score or ranking assigned to an insurance risk (i.e., a prospective insured) based on that risk's underlying characteristics"
   a. Generates information for underwriting and pricing
   b. Provides a relative measure of an insured's expected cost
2. **Credit-based insurance score** – insurance score that "utilizes various attributes found in a typical individual's credit report"
3. Different models built by insurers and third-party vendors
4. Attributes seen as important
   a. Number of inquiries into opening new accounts
   b. Accounts 30 days or more past due
5. Strong correlation between scores and risk's expected costs; statistically reliable

B. Evaluation of How Insurers Use Credit-Based Insurance Scores

1. Standards for rates
   a. Prohibition of ones that are excessive, inadequate, or unfairly discriminatory
   b. Should be actuarially sound estimates of the costs of risk transfer
   c. Overall rates should be sufficient
   d. Individual rates should reflect expected costs
2. Most insurers begin using scores in the period 1998-2001
3. Uses
   a. Determine whether prospective insured qualifies for underwriting
   b. More frequently used for risk segmentation
      1) May constitute risk classification factor
      2) May determine the tier to which an insured is assigned
4. Actuarial Standard of Practice No. 12: "Risk Classification"
   a. Risk characteristics should relate to expected outcomes
   b. Relationship demonstrated if variation in actual or reasonably anticipated experience is correlated with the characteristics
   c. Rates are equitable if rate differences reflect differences in expected costs
   d. Should take into account interdependence of characteristics
5. Insurers contend that use of insurance scores, multivariate rating, and other new rating factors expand availability

C. Discussion of How Current Economic Conditions Have Affected Policyholder Premiums Related to Credit-Based Insurance Scores

1. Impact on aggregate premium
   a. Scores not used to determine overall premium need but relationships between classes
   b. If economic conditions affect all scores equally no change to the overall premium nor to rate relationships between insureds
2. Impact on individuals' premium
   a. Regulators may have concerns that shift in scores could disrupt relative rates, whereas cost differences do not change
   b. But such seen as common in insurance and are corrected by rate differential analysis
   c. But possible that harm is done before a new analysis makes corrections
   d. But so far no evidence of a dramatic shift in credit scores

PAST CAS EXAMINATION & REVIEW QUESTIONS

1. A regulator is evaluating a rate filing in State X that incorporates the use of credit-based insurance scoring.

   a. Define a credit-based insurance score.

   b. Briefly describe two ways an insurer could use credit-based insurance scores. (11–6US–1a&b–.5/.5)

R1. What, according to Kucera, should a shift in credit scores do to aggregate premium collected?

R2. Describe two ways that insurers use individuals' credit scores in underwriting.

R3. When Kucera gave his speech (2009) there was a global economic crisis. Some people feared that an economic crisis could impact the credit scores of individuals and thus their premium. What, according to Kucera, had been observed so far? What are two possible reasons for this observation?

R4. Kucera discusses two ways of examining the impact of an economic crisis via credit scores on premium. What are these two different ways?

R5. Several studies have already been done looking at the relationship between individual credit scores and two lines of business. What are these lines of business?

R6. Some insurers argue that the use of credit scores allows them to write more insureds. Defend this argument.

SOLUTIONS TO PAST CAS EXAMINATION & REVIEW QUESTIONS

1. a. A credit based insurance score is a ranking of the relative risk of a policyholder based on its characteristics and items found in a credit report. Examples of such items are the number of inquiries for new accounts and balances 20 days overdue.
   1) Credit based insurance score is a score or rank assigned to a risk based on attributes commonly found in a credit report. The purpose is to estimate the relative expected loss.
   2) It's a score based on insured's credit history.
   3) A credit based insurance score is a calculated value attempting to gauge an insured's insurance risk based on its credit history.

   b. Segment risks based on insurance score, and charge higher premiums to risks with worse scores and lower premiums to risks with better scores.
   1) Use insurance scores to determine whether or not to offer coverage to risks with worse scores.
   2) Use insurance scores to slot risks into one of several underwriting companies.
   3) Use insurance scores to target certain market segment in the marketing campaign.

R1. Let us assume that the insurer is using credit scores to rate individual insureds. In the long run, unless overall loss costs or expenses change, the aggregate premium should not change. This is because credit scores are used to assign individuals to different classes, but the overall premium needed is not changed.

R2. (1) An insurer may use an individual credit score in deciding whether or not to underwrite that individual.
(2) An insurer may use an individual credit score to assign the individual to a particular tier of insureds.

R3. At the time of his speech, the crisis had been about six months in the making. So far the impact on insurance, according to anecdotal evidence, had been minor. One reason for this could be that most insurance is based on renewals and this would see less change in the rates. Another possible reason would be that the crisis needed more time to be felt in the overall premiums.

R4. He believes one should look at the (1) aggregate premium (2) individual premiums.

R5. Private passenger automobile and Homeowners (see Appendix).

R6. Instead of declining the insured, which they would have to do without the credit score, they can assign the insured to a higher tier.

Kevin M. McCarty, "The Impact of Credit-Based Insurance Scoring on the Availability and Affordability of Insurance," May 21, 2008.

OUTLINE

I. <u>OVERVIEW</u>

A. <u>Use of Credit-Based Insurance Scores in Personal Insurance Lines</u>

1. Proponents
   a. Scores are predictive of future claims experience
   b. Serve as a necessary underwriting tool
2. Critics – scores are another example of discrimination against lower-income people
3. Studies do show predictive value but also disparate impact
4. Most insurance professionals undecided about whether use is unethical
5. Use requires examination of the acceptability of factors used in underwriting and rating
6. Wide variety of information is available that correlates with insurance claims but their usage is not necessarily fair and valid

B. <u>Other Rating Factors Considered To Be Important</u>

1. Different life expectancies by race can be used to justify different rates but produce negative results
   a. Violates equal protection for consumers
   b. Results in poor public policy
2. 1996 – Health Insurance Portability and Accountability Act outlaws usage of genetic testing for health insurance purposes
3. 2007 – FL holds hearing on whether the rating factors of occupation and education serve as proxies for race

II. <u>PROBLEMS WITH THE USE OF CREDIT SCORES</u>

A. <u>The Credit Reporting System</u>

1. Inherent weaknesses in the credit reporting system are also a problem that may invalidate the usage of credit scores
2. Groups that are negatively affected by credit reports to a disproportionate degree
   a. Recent divorcees
   b. Recently naturalized citizens
   c. Elderly
   d. Disabled
   e. Those with certain religious convictions
   f. Younger individuals with no credit histories
3. Economic downturn may increase differentials in credit scores

4. Results of empirical studies
   a. Differential only in the frequency of claims, not in their magnitude
   b. But frequencies of insured loss events may be the same even though frequencies of claims filed differ; those with lower incomes file more claims
   c. No suggestion that claims filed are not legitimate or that rates charged excluding credit scores are not actuarially sound

5. Opaqueness of methodology that produces credit-based insurance scores
   a. Variation by company
   b. Affected by financial decisions not linked to insurance risks, e.g., having an installment loan

B. Disproportionate Impact of Credit-Based Insurance Scores

1. Concern over the relationship between credit scores and the following:
   a. Race
   b. Ethnicity
   c. Income status

2. Though credit scores are not a proxy for race, relationship may be strong enough to prohibit their usage because of discrimination

3. Lower average credit scores found in the following groups:
   a. African-Americans
   b. Hispanics
   c. Young people and elderly as use credit less often
   d. Certain religious groups that do not use credit
   4. Scores seen as not measuring event risk but indirectly measuring socioeconomic status

III. THE RESPONSES TO THE PROBLEM

A. Florida Actions Regarding Credit-Based Insurance Scores

1. 2003 – FL passes a law limiting usage of credit scores in PPA and HO insurance

2. Four industry challenges to the law
   a. FL regulators did not have authority to prevent usage as an underwriting/rating tool
   b. FL regulators did not have authority to define “unfairly discriminatory”
   c. Insurers lacked necessary data to show effect of scores on protected classes
   d. Definition of “disproportionate impact” seen as too vague – only challenge upheld by the administrative law judge

B. Conclusion and 2007 FTC Report

1. Negative impacts seen to outweigh benefits of enhanced accuracy

2. Concern about similar variables, namely occupation and education

3. Fair and Accurate Credit Transactions Act (FACTA) of 2003 mandates an FTC report, which proves disappointing
   a. Data may have been selected to present the best case for scores
   b. No premium used
   c. Economic advantages of the usage of scores seen as conjectures
   d. Industry, but not regulators, received advance copies of the report

C. <u>State Involvement</u>

1. 48 states have taken legislative or regulatory action limiting the usage of credit scoring

2. Many adopted model legislation or a variation of it

3. Many legal provisions involve the following:
   a. Notification of consumers of its usage
   b. Allowing regulators access to the scoring model
   c. Restricting decisions based only on the model

4. Other legal provisions
   a. Disallowance of credit history as the sole basis for underwriting/rating decisions
   b. Prohibition of usage of credit history for policy cancellation or nonrenewal or for rate increases
   c. Banning credit history for underwriting or rating existing customers
   d. Banning credit history for underwriting or rating in all cases

5. Important the federal action not detract from states' regulatory power

6. HR 5633 seen to have some favorable provisions
   a. FTC to examine in more detail relationship between credit scores and race/ethnicity
   b. But other agencies should also investigate

7. HR 6062
   a. Agrees with its exemption of personal lines insurance from the Fair Credit Reporting Act
   b. Recognizes that FTC report found a disparate impact on minorities and thus as a starting point credit scoring should be eliminated
   c. Reliance on the Fair Credit Reporting Act consistent with separation of powers of McCarran-Ferguson

8. Differing views on credit scoring found in other states
   a. Not a concern if one of many factors
   b. Any disparate impacts on race/ethnicity seen as coincidental
   c. Most consumers benefit from it
   d. No need to expand the analysis to occupation or education

PAST CAS EXAMINATION QUESTIONS

1. A regulator is evaluating a rate filing in State X that incorporates the use of credit-based insurance scoring.

   a. Briefly describe two reasons the regulator might support the use of credit information in ratemaking.

   b. Briefly describe three critiques of the use of credit-based insurance scoring that a consumer advocate taking McCarty's position might make.

   c. A recent downturn in the economy of State X may affect the usefulness of credit-based insurance scoring. Propose one analysis that the company actuary could undertake to ensure the continued appropriateness of the overall rate level in State X. (11–6US–1c,d&e–.5/.75/.5)

2. a. Briefly describe two reasons that using credit scores in insurance may be appropriate.

   b. According to McCarty, describe three reasons why the use of credit score in insurance ratemaking may not be appropriate.

   c. Assume that an insurer uses credit scoring in ratemaking. Discuss the impact an economic downturn would have on
   - Insurance consumers
   - Insurance companies
   - Regulators

   (14S-6US-5-2.75:0.5/0.5/1.75)

3. a. Briefly describe the cost-based condition for insurance rates to be considered equitable.

   b. According to McCarty, briefly describe two conditions for insurance rates to be considered equitable to consumers.

   c. An insurance company finds a significant correlation between a driver's claim frequency and the number of text messages sent. The insurance company proposes segmenting groups into low and high risk categories based on texting frequency.

      Describe whether the insurer's use of texting frequency as a rating variable would be considered equitable in each of the following contexts:

      - Within a risk classification system

      - From the perspective of an individual consumer

   d. In a scenario where all auto insurance companies except for Insurer X are using texting frequency as a rating variable, discuss a concern that a regulator might have regarding Insurer X's financial stability.

   e. Based on the concern discussed in part d. above, briefly describe two IRIS ratios that the regulator should examine and the trend that the regulator should look for in each ratio to validate the concern.

f. Assuming that Insurer X does not introduce texting frequency as a variable, describe one action that Insurer X could take to remain competitive. (14F-6US-2-3.75:0.25/.5/1/0.5/1/0.5)

4. a. According to McCarty, identify the two age groups where insureds are disparately impacted by the use of credit scoring and briefly describe the reasoning.

   b. Other than age groups, identify one group of insureds that McCarty claims is disparately impacted by the use of credit scoring and briefly describe the reasoning.

   c. Empirical studies have shown that those with different credit scores have an observed difference in total insurance losses. Identify a key metric and describe how the metric could be driving these loss differences.

   (15F-6US-1-2.25:1/0.5/0.75)

5. a. Assume that credit scores are significantly different between genders, and as a result, a law has been proposed to ban the use of credit scoring in personal lines ratemaking.

   Describe one argument in favor of and one argument against this proposed law.

   b. Assume that personal lines insureds with better credit scores counterintuitively have a higher claim frequency.
      i. Propose an explanation for observed frequency difference
      ii. In the context of these results, describe one argument in favor of and one argument against the use of credit scores in personal lines insurance. (16S-6US-1-2.5:1/0.5/1)

6. An insurance company uses credit-based insurance scoring as part of its personal auto rating plan. A recent severe countrywide economic downturn is believed to be causing a lowering of credit-based insurance scores among consumers.

   a. Describe one concern regulators may have regarding the response of the company's rating plan to the changes.

   b. Briefly describe and justify two ways in which the pricing actuary could reflect the impact of the economic downturn on credit-based insurance scores in an upcoming rate filing.

   c. To protect consumers against the possibility of large rate swings due to deteriorating credit-based insurance scores, the regulator requests that the insurer cap the renewal rate increase for each policyholder. Describe two ways this might violate the ratemaking principles outlined in the CAS "Statement of Principles Regarding Property and Casualty Insurance Ratemaking."

   (16F-6US-2-2.5:0.5/1/1)

7. a. Provide one counterargument for each of the following regulatory concerns with using credit-based insurance scores as a rating variable during an economic downturn:

      i. A shift to lower credit scores will result in higher premiums for all insureds.

ii. A dramatic shift in credit scores will disrupt the current rate relativities, resulting in incorrect individual premiums.

b. Other than the concerns listed in part a. above, briefly describe two concerns that regulators have expressed regarding the use of credit-based insurance scores in ratemaking.

c. Identify three actions that regulators can take to limit the use of credit-based insurance scores.

(17F-6C-1-2.25:1/0.5/0.75)

SOLUTIONS TO PAST CAS EXAMINATION QUESTIONS

1. a. Credit scores show the relative risks of the consumers correlated to the score ranges. They allow insurers to price insurance better based on the consumer's relative risks.
   1) Scores allow the insurer to compete better in the market, creating insurance availability.
   2) A majority of policyholders benefit from the use of credit scoring, having lower rates than they would have in the absence of credit scoring.
   3) Allows insurer to write more business.
   4) Allows insurer to price more accurately.
   5) Credit based scores are predictive of future loss experience.

   b. (Social)
   1) Use of credit is counter to equal protection for consumers and not sound public policy.
   2) Use of credit is not measuring insurance risk, but indirectly measuring socioeconomic status.
   3) The disparate impact based on race or ethnicity is discriminatory.
   4) Has a disproportionate negative effect on low income people and protected classes of citizens.

   (Data Issues)
   5) Credit report data can often be inaccurate.
   6) Credit reports can be adversely impacted by things outside the direct control of the insured (identity theft, age, religious beliefs, disability, economic conditions).
   7) Approximately 50% of credit reports contain errors.
   8) Many groups of people do not use credit – example certain religious groups.
   9) Errors in credit reports are widespread and may invalidate the use of credit history.

   (Opacity)
   10) Credit scoring methodology is difficult for consumers to understand.
   11) Resulting credit scores from models can be negatively impacted by sound financial decisions that can't directly be linked to insurance risk.
   12) Credit scoring methodology varies significantly from company to company.
   13) Consumers don't understand how the scores are impacting them.
   14) Calculation of credit scores is complex and not transparent to consumers.
   15) Opaque to consumers who cannot link financial decisions to insurance prices.
   16) Credit scores have only been shown to be productive of claim frequency, but not severity.

   c. Determine if the relative magnitude between levels of scores is still supported; increase / decrease overall rate levels to balance any distributable shifts.
   1) Determine if the relative magnitude between levels of scores is still supported; increase / decrease overall rate levels to balance any distributable shifts.
   2) Actuary should review the premium in the state to ensure that overall premium is adequate. Then, redistribute premium/ rate base on the relativity of the insurance score / relative risk.
   3) If all scores increase by a factor of say 5% the actuary could renormalize all scores so that the average level remains unchanged.
   4) Actuary should estimate the impact of economy downturn on overall insurance score. Then, apply it to adjust pricing. If a person's insurance score is dropping at average level, he should not be surcharged. He should only be surcharged if drop in score is more than average.
   5) Using a multivariate model recalculate the relatives between various credit scores then off balance these to assure the correct overall rate level is achieved.
   6) Adjust overall credit scores to have neutral affect this would cause no charge in overall premium.
   7) The overall amount of loss should not presumably be affected, so the insurer should adjust the base premiums so the overall amount is adequate, similar to adjusting for changes in home values in homeowners insurance.

2. a. Two of the following:
    - reflect differences in expected costs, loss costs, frequency, severity
    - appropriate for risk differentiation
    - increases availability
    - won't lower rate level overall if not used
    - lowers pricing risk and thus overall costs
    - objective and available measure
    - difficult to manipulate

   b. Three of the following:
    - weakness in credit reporting system
    - errors in reports due to identity theft
    - disproportionately affected by certain life events: divorce, recent citizen, disabled
    - discriminates against those who don't use credit
    - opaque to consumers
    - disparate impact to select ages, race, and religious groups
    - indirectly measures socioeconomic status
    - privacy concerns
    - reflects frequency not severity, claims reporting pattern
    - studies didn't use premium

   c. **Consumers:**
    - Credit scores may decrease (uniformly, in segments)
    - Premium increases temporarily, assuming companies adjust accordingly
    - Inherent riskiness hasn't changed
    - Premium increases permanently, assuming loss costs increase
    - Might not be impacted if company does not rerun score for renewal
    - Rate can go up if score decreases more than average (person lost job, etc.)
    - Might drop coverage

   Insurance Companies:
    - Will see a change in credit score distribution, uniform or otherwise
    - Will need to examine relativities among risks
    - Will need to decrease/increase overall loss cost estimate, depending if loss costs are assumed to have changed or stayed the same
    - similar to AOI on homeowners
    - Will reconsider relativities/loss costs due to competitive pressure, adverse selection, loss of market share
    - Might be temporary increase in profit due to increased rates

   Regulators:
    - Increased complaints from consumers
    - Need to apply additional scrutiny to rate filings
    - may reexamine use of credit scores in rating models
    - May see availability decrease and increased residual market

3. *Note that this question pulls from multiple readings, covering subjects from learning objectives A1, A2 and C2*

a. It gives lower risks the rate they deserve based on their expected loss cost and eliminates possible subsidization

b. Two of the following:
- Rates should not be based on factors that correlate highly with race, ethnicity, religion and other protected factors.
- Factors that the insured is charged for (factors used in rate calculation) are under the insured's control.
- Another condition is that rates actually correlate to the underlying risk. For example, McCarty expressed concerns that a downturn in the economy could cause abrupt and unjustified changes in credit-based insurance scores.
- Should not be subject to inaccuracies, e.g., credit scores are often wrong.

c. Within a risk classification system:
- Using texting frequency will create a more refined classification system and make the rate more aligned with true risk condition, thus equitable.
- Unequitable– if the texting data was self-reported it could be prone to error which would make it unreliable.

From perspective of an individual consumer:
- Not equitable as there is no clear causation between texting and driving
- Would have privacy issues. Meanwhile, will have disparate impact on certain groups of people, e.g., those sending messages frequently while not driving. This is not equitable.

d. Due to anti-selection, high risk insured tend to purchase insurance from insurer X, thus may result in insolvency issue for insurer X.

e. Many possible answers, here are some examples:
- 2 year operating ratio: Is the insurer's profitability decreasing due to adverse selection? Regulator should look for increasing trend and ratio > 100% to identify unprofitability
- NWP to Surplus: Insurer X may see premium growth with smaller surplus increase (or even decrease), with ratio becoming higher over time.
- Change in NWP: See if it's grown in the last year. It's an indicator if insurer did not take steps to actively grow business that it's being adversely selected against.
- Gross Δ PHS o As the increase high risk insureds will raise liabilities and therefore decrease PHS, should look for negative trends.

f. Many possible responses
Find a proxy variable for texting: Insurer X could refine its rating based on other rating variables to avoid adverse selection by picking up texting variable with something correlated but more reliable.

4. a. The elderly and young adults. Young adults typically have not had the time to build a good credit score or credit history. The elderly typically use less credit, and if they are on a fixed income they may also have lower income which also correlates to a lower credit score. If credit scoring is used to determine rates, these groups will be at a disadvantage.

b. One of the following (others possible):

- People of lower socioeconomic class – may have lower score due to lack of available lines of credit b/c of their income, for example. This drives up premiums for something that is beyond their control.
- Certain religious faiths which don't support the use of credit / usury / interest, so they wouldn't have fair credit scores – doesn't tell about driving ability.
- Race / minorities - McCarty claims credit scores are a proxy for race and socioeconomic status. Poorer minorities are more likely to have a low credit score and insurance companies are effectively increasing their rates.
- Recently divorced – they had credit w/ their spouse that they most likely had to cancel.
- New citizen / new immigrants – those who just moved to the US have no or short credit history, therefore probably won't have high credit score. They would be disparately affected.
- Disabled / handicapped – more difficult to find jobs and keep steady income. Creditors may be less likely to provide them loans.

c. One of the following (others possible):

- Frequency of claims / percent of accidents reported / willingness to file a claim / risk absorbing – people with high credit scores may pay for smaller claims out of pocket while low credit scores may file a claim with insurance company. Therefore those with high scores will have lower total losses since they are paying for some claims themselves.
- Income / wealth / affluent / socioeconomic status / more resources / wage – Individuals with higher income tend to have higher scores. Higher income individuals are more likely to retain smaller losses as opposed to lower income insureds. This translates to lower total insurance losses for higher income (higher credit scores) insureds and vice versa for lower income (lower credit scores) insureds.
- Responsible / carelessness / self risk control / managing credit score – people with lower credit scores are thought to be not very responsible in their finances. That could translate into irresponsible driving behaviors, which lead to higher expected losses. People with higher credit scores -> more responsible / careful drivers -> less expected losses.
- Late payments / paying bills on time / pay off debt / number of days overdue / accounts overdue / balances over 90 days overdue – paying on time is a key metric to your credit score and it speaks to a person's responsibility. Someone who is more responsible is generally more aware and avoids losses thus lowering their total losses.
- Number of inquiries / attempts to open credit cards – one would seek to open new credit accounts to relieve one's financial distress temporarily. This lowers the credit score and this person is more likely to file a claim since he/she is unlikely to be able to absorb further financial damages.
- Length of time credit lines have been open – if an 18 year old driver pulls a credit score, its likely to be low since they probably haven't had lines of credit open for too long. They also have limited driving experience due to age, which could drive up their total insurance loss.
- Deductible – people with higher credit score tend to buy coverage with higher deductible. As a result their incurred losses are smaller because they are on net of deductible basis.
- Location car is most frequently parked – minority groups appear to be disparately impacted by the use of credit scoring. Over time, it is argued that socioeconomic barriers, as well as unfair lending practices against these groups, have led to worse credit situations. Urban areas, which tend to have higher populations of minorities, also have higher population density, which leads to more frequent losses.

5. a. *In favor of banning*:
Credit scoring can be considered highly discriminatory since it can be based on region, affluence, race, gender, etc. Banning the use of this variable could be appropriate to avoid discriminating and to avoid public outcry over the matter. Social acceptance is an important aspect in selecting rating criteria.
Against banning:
The scores are correlated with loss experience. By banning you force un-actuarial premiums to be charged. Low risks pay more than they should and high risks are being subsidized.

b. i. One of the following:
- A high credit score driver may carry high debt on a car. Therefore, there might be a diminished sense of ownership leading to drive more recklessly. Whereas a low credit score driver may own the car without financing, leading to more cautious driving. (a)
- People with better credit scores have better education and awareness of insurance, they tend to file a claim whenever they believe that they are covered. Whereas lower credit score people may not have the awareness or resources to file a claim.
- The people with higher credit scores live in metropolitan areas. Metropolitan areas are highly populated and more accidents are likely to happen so they have more frequent losses than low income suburban families who live in less densely populated areas.

ii. *Arguments for using credit scores (can be tweaked to suit part b.i. above):*
- Credit scores provide insight into insureds habits (like spending habits, risk aversion or lack thereof), so using credit scores to assign insureds to risk classes will predict loss expenses more accurately, which will increases availability.
- If higher credit score insureds really do drive more and have higher frequency, it is fair for them to pay higher premiums so that low scores aren't subsidizing them.

Arguments against using credit scores (can be tweaked to suit part b.i. above):
- Because credit scores produce a counterintuitive result, and studies have shown that more than 50% of credit scores contain errors, in addition to identity theft problems, credit scores should not be used in pricing.
- Credit score is just a proxy for something else. Use urban versus rural instead; it's more intuitive and understood by policyholders

6. a. Regulators would be concerned that insureds would have an increase in premium AND (one or more of the following): without a change in inherent risk; it would be excessive or company would earn excessive profits; it would disproportionally impact protected classes or lower income people or lower socioeconomic insureds; would be unaffordable; would lead to less availability of insurance o it is unfair or inequitable or not actuarially sound

b. Two of the following (others possible):
- If the current rate relativities between score classes remains valid, and CBIS scores are dropping in essentially a uniform fashion, the pricing actuary would respond to the distributional shift via an offsetting change to the base rate. There would be no long-term impact on the premium collected just from the CBIS shift.
- Remove CBIS from rating by using a proxy to replace it or recalibrating other rating variables absent the CBIS
- Incorporate the rising premiums into the premium trend selection, which will result in a decrease in the overall indication
- Use CBIS only in accept/reject or tier placement underwriting decision making instead of in rating.

- Capping the overall premium change that insured would see as a result of their credit score change
- Remapping or changing the ranges of CBIS corresponding to certain factors in rating
- Freezing insureds' credit scores or using an average score over several years to limit the impact
- Restrict CBIS score changes from resulting in an increase in premium. Only allow the impact to be premium neutral or result in a decrease.
- Change the rate differentials similarly to how Homeowners rating will change when the housing market shifts.
- Calculate the overall premium after the downturn using CBIS from before the downturn and compare to the total charged premium after the downturn.

c. Two of the following:

- Principle 1: *A rate is an estimate of the expected value of future costs*. Capping premiums results in the expected future costs being higher than the rate charged.
- Principle 2: *A rate provides for all costs associated with the transfer of risk*. By capping individual insureds and not adjusting the premiums of the other insureds, the company is failing to provide for all costs associated with the transfer of risk on an aggregate level
- Principle 3: *A rate provides for the costs associated with an individual risk transfer*. Capping individual premiums prevents insurer from charging a rate that accounts for all costs associated with the transfer of risk on that individual.
- Principle 4: *A rate is reasonable and not excessive, inadequate, or unfairly discriminatory if it is an actuarially sound estimate of the expected value of all future costs associated with an individual risk transfer*. Capped rates would be lower than the actuarial sound rate prescribed by the rating plan, leading to overall inadequate rates.

7. a. Sample, others possible

i. If all credit scores are lower without changes to relativities and inherent risk, then the actuary will lower the base premium to reflect this shift. Insurers review base premium regularly to stay competitive.

ii. Relativities are also reviewed regularly by actuaries who adjust them accordingly (e.g. relativities between male and female young drivers in auto insurance)

b. Two of the following:

- Unfairly discriminatory. Credit score may be a proxy for their rating factors like low income, education, religion. Then using credit score may negatively affect certain classes of people.
- It is not clear how credit scores are calculated, so it's another black box added to the process for calculating premiums
- Credit scoring negatively impacts recently divorced, younger, and elderly people when the reason is from things such as never having a credit card before
- Sound financial decisions (paying off debt) can negatively impact CBIS, which seems counterintuitive
- There can be errors in credit reports which aren't the fault of the policyholder
- It has been observed that only frequency, not severity increases as credit scores decrease, signaling that people with lower scores may just be more likely to file their claims.

c. Three of the following:

- They can completely ban use of credit based insurance
- Limit use of credit based insurance to underwriting and not rating
- Only allow the use of credit scores for renewals if it reduces policyholder premium
- Prohibit the use of credit-based insurance scores in ratemaking and rating plans
- Only can use credit scores to rate a new business policy, but can't request score again upon renewal

- Limit the price relativity factors that an insurance company can apply to the premiums based on insurance score, factor capping/limitations
- The state could prohibit credit based insurance score being the sole reason for decisions
- Regulators can require insurers to send out written notice to policyholders that they are to be rated based on credit-scores
- Scrutinize the model used to calculate factors for credit