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January 16, 1998

Ex Parte

Magalie Roman Salas
Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, D.C. 200554

RECEIVED

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Re: Federal-State Joint Board on Universal Service; CC Docket 96-45 /
Forward-Looking Mechanism for High Cost Support for Non-Rural LECs;
CC Docket No. 97-160

Dear Ms Salas:

Last month, the proxy model sponsors submitted version 5.0 of the Hatfield Model ("Hatfield 5.0") and version 3.0 of the Benchmark Cost Proxy Model ("BCPM 3.0") to the Commission for its evaluation. In addition, the Commission's staff released a second version of the Hybrid Cost Proxy Model ("HCPM2"). Because the Commission has not established a schedule for comments on these models, Bell Atlantic is submitting the following observations, along with the attached analysis by National Economic Research Associates, in this *ex parte* submission. We request that this material be made a part of the record in the items captioned above.

1. The HCPM2 is still only a partial proxy model. It provides only customer location and loop investment modules. For this reason, it cannot be fully evaluated in light of all of the Commission's own criteria for a forward-looking cost proxy model.. However, a preliminary assessment of the HCPM2 attached hereto suggests that it does not fully satisfy those criteria .
2. As is discussed in the Attachment, the regression approach that the Commission's staff used to add usage costs and expenses from the earlier version of the BCPM (the BCM2 model) to the HCPM2 results is not reliable. As a result, the amount of support that would be generated by this model is likely to be significantly different than the staff's estimate of

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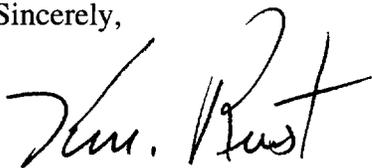
\$10 billion. This makes it premature for the Commission to make policy decisions concerning use of the model to calculate the amount of universal service support.

3. Although proponents of these models claim to have improved on their approach to customer location, all of the models continue to provide inaccurate estimates of line counts. The Attachment illustrates the continuing line count inaccuracies by comparing model line counts to actual line counts at the wire center level. This suggests inaccuracies in the proxy models' determinations of customer locations, the numbers of customers, the numbers of lines per customer, or all three. While the Hatfield 5.0 and the BCMP 3.0 claim to incorporate geo-coded data to identify customer locations more accurately, these data omit significant numbers of customers, especially in the high cost rural areas that are the most important for purposes of calculating the need for universal service support.

Bell Atlantic's limited analysis of the HCPM2, BCPM 3.0 and Hatfield 5.0 raises serious questions about whether any of these models can be used for estimating the forward-looking economic cost of universal service support. The models still do not take into account all of the factors that determine the design, construction, and cost of an actual network on a forward-looking basis. In addition, they continue to demonstrate inaccuracies in such basic data items as the number of lines and the locations of customers. The Commission should not adopt any of these models without providing notice and an opportunity for comments on the latest iterations. In light of the chronic defects in the models, however, the Commission should abandon its efforts to develop a proxy model and, instead, should use carrier-specific engineering studies of actual forward-looking costs to calculate universal service support levels in each area.

Any questions on this filing should be directed to me at either the address or the telephone number shown above.

Sincerely,

A handwritten signature in black ink, appearing to read "Tom Rust". The signature is written in a cursive, somewhat stylized font.

Attachment

cc: T. Peterson
C. Keller

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**Still Not Ready for Prime Time: An Assessment of Initial Results from
HCPM 2, HM 5.0 and BCPM 3.0**

Harold Ware

In this overview, I summarize preliminary observations about and results from: the second release of the FCC staff Hybrid Cost Proxy Model (HCPM 2); Hatfield Model 5.0 (HM 5.0); and the Benchmark Cost Proxy Model 3.0 (BCPM 3.0). The information presented below suggests that further development work is needed before these proxy models can be considered for use in determining universal service support.

1. Proxy model wire center line estimates differ substantially from each other and from actual line counts.

To assess how well the models estimate line counts, we: calculated wirecenter densities from actual USWest and Bell Atlantic data for Colorado, New Jersey and New York; selected samples of wire centers stratified by density for each state; ran the new models for each of the 112 wire centers in the sample; and, calculated the percent errors from the actual line counts.

The results show that the models continue to support my earlier finding (for Colorado) that the proxy model line estimates differ substantially from each other and from actual wire center line counts,¹ despite refinements including the HM 5.0 effort to geocode customer locations.

- In Colorado, the errors in the total line estimates range from +57 % to -66% for HM 5.0, +30 % to -72% for HCPM 2, and +25 % to -76 % for BCPM 3.0. The average (absolute values) of the errors are 24% for HM 5.0, 21 % for the HCPM, and 19% for the BCPM 3.0. See figure 1 below. The errors for residence and business continue to exhibit substantial variation, with the largest errors observed for the business estimates. See figures 2 and 3
- In New Jersey, the errors are also substantial, although somewhat lower. See figure 4. The estimates are similarly erratic for the residence and business line counts, with the business estimates being the most inaccurate. See figures 5 and 6.

¹ Harold Ware, "Analysis of Hybrid Cost Proxy Model," Attachment 1 to Comments of Bell Atlantic on Hybrid Cost Proxy Model, in CC Docket Nos. 96-45 and 97-160. Submitted November 26, 1996.

- The estimates are even less accurate for New York. The average errors range from 28% for the HM 5.0 to 33% for BCPM 3.0. The range of errors is from + 42% to - 100% for HM 5.0, from + 54% to - 84% for HCPM 2, and from + 132% to - 100% for BCPM 3.0. The estimates for residence and business lines are less accurate. Business estimates for New York vary from + 158 % to - 87 % for HCPM 2; + 369 % to - 100 % for BCPM 3.0, and + 209 % to - 100 % for HM 5.0. Interestingly, the range is smallest for the HCPM 2, which has not benefited from the “refinements” such as geocoding. See figures 7, 8 and 9.
- The pattern of results suggests that using scaling factors to true up wire center estimates is unlikely to generate accurate line and cost estimates for smaller geographic areas such as Census Block Groups (CBGs) and Census Blocks (CBs). Indeed, this approach could continue to yield inaccurate wire center-level cost estimates because simply scaling up (or down) all the CB line estimates for example will generate excessive (or insufficient) line estimates on the hypothetical feeder and distribution routes “built” by the models.

2. Proxy model estimates of investment per line differ substantially at the wire center level.

As I understand it, proponents of the proxy models argue that convergence of average proxy model cost estimates suggest that the proxy models are becoming more suitable for policy applications. Policy makers should keep in mind that statewide or even density group averages mask the continuing, substantial variations across wire centers. The results summarized by figures 10, 11 and 12 depict the substantial differences in estimates at the wire center level (For this purpose, we compared the HCPM2 least-cost grid size estimates with the estimates from each of the other models). Discrepancies at the wire center level tend to balance each other out and obscure the true differences when more aggregate data are reviewed.

Note that HCPM 2 seems to underestimate substantially the line counts for NY, especially in the higher density wire centers; thus, we might expect it to produce higher costs per line than the other models. However, the cost estimates produced by HCPM 2 are much lower than those from the other two models for high-density wire centers in New York; thus, the FCC staff needs to revise how the model treats densely populated urban areas. (As they have recognized, HCPM 2 still does not make use of Census data on multi-unit and high-rise buildings.)

3. Attempting to evaluate HCPM 2 in terms of the ten FCC proxy model criteria reveals that, despite its improvements, HCPM 2 requires additional work before it can be fully evaluated.

a. Overview

HCPM 2 includes a number of refinements compared to HCPM 1. I have previously identified limitations of the HCPM modules and proxy cost models in general. In addition, as recognized by the HCPM’s developers, the model continues to be a partial model.

- The model can not be fully evaluated in light of all ten FCC criteria (para 250 of FCC 97-157) because it does not even consider depreciation, rate of return or allocations of common

costs. HCPM 2 can only be partially evaluated in terms of other criteria because it omits investment costs (for switching, transmission and signaling) and does not deal with any expenses. We would need to see a complete model with HCPM embedded in it, as well as inputs and results, to assess fully whether the HCPM is consistent with the criteria. Further, we cannot compare fully the estimates from the various proxy cost models with each other or with the actual company-specific, forward-looking cost estimates.

- The HCPM refinements include: (1) calculation of technology crossover points based on investment costs for copper, T1 on copper and fiber—subject to user-adjustable technological distance constraints for copper loops, and for feeder type; and (2) use of multiple SAIs. However, the HCPM remains subject to the same fundamental flaws that I pointed out in my above-cited report.

b. Initial evaluation of HCPM 2 using 10 FCC criteria

Criterion 1. The technology assumed in the model must be the least-cost, most-efficient, and reasonable technology for providing the supported services that is currently being deployed...

The HCPM may be intended to minimize the total investment in outside plant; however, for reasons explained in my earlier report, minimizing investment does not produce “the least-cost, most efficient and reasonable technology for providing the supported services....” Minimizing costs requires consideration of: (1) on-going maintenance and repair expenses, as well as investment costs; and (2) switching, transmission and signaling costs, as well as loop costs. Telephone companies’ engineering guidelines account for all of these considerations. (For example, they realize that choice of switching technology will affect the costs for loops and transmission equipment that must work with the switch.) Thus, even if the HCPM modules were embedded in one of the other proxy models, the combined model would not do this overall cost minimization exercise. In addition, the proper cost minimization exercise is to minimize total costs of all services, not only costs of supported services. To the extent that the HCPM uses copper as opposed to fiber for areas in which actual companies would employ fiber, it could impede the provision of advanced services.

Criterion 2. Any network function or element, such as loop, switching, transport, or signaling, necessary to produce services must have an associated cost.

The HCPM does not model a complete network, so this criterion cannot be applied fully to the HCPM.

Criterion 3. Only long-run forward-looking economic cost may be included....

The HCPM continues to reflect the fundamental flaw of proxy cost models: they do not produce true forward-looking costs for any real-world firm, because no real-world firm would build a network at one time to meet all demand. Criterion 3 also says that the period must be long enough such that all costs must be variable and avoidable. This implies that some consideration should be given to wireless technologies which would probably lower costs in low density areas.

Criterion 6. The cost study or model must estimate the cost of providing service for all businesses and households within a geographic region....

Unfortunately, in its present form, the model uses extremely inaccurate estimates of lines based on outdated BCPM2 (CBG-level) estimates. As described above, these inaccurate estimates imply that the costs are very imprecise, and even truing up to the wire center level could leave significant imprecision in the results.

Criterion 8. The cost study or model and all underlying data, formulae, computations, and software associated with the model must be available to all interested parties for review and comment....; and, Criterion 9. The cost study or model must include the capability to examine and modify the critical assumptions and engineering principles....

The FCC staff have been extremely cooperative in making the data available; however, changing the inputs to CENBLOCK is not possible without obtaining at least three pieces of software and the detailed Census block data and going through what appears to be a difficult labor-intensive process. For example, to correct wire center line counts, it would be necessary to reproduce and modify the input files used by CENBLOCK by: (1) obtaining Exchange Info Plus data base and the mapping software to use it to create wire center boundaries; (2) obtaining the now outdated BCPM 1.1; (3) obtaining STF 1-B from the Census Bureau; (4) obtaining an old version of Paradox and the program written by the FCC staff; (5) extracting the data from the above files; (6) recreating the inputs; and (7) changing the CB-level line counts so the wire center totals matched the actuals. (HM 5.0 engineering assumptions are in clustering algorithms which generate customer location data and which apparently cannot be examined or modified by the user. See HM 5.0 Model Description, p. 27, fn. 27.)

Criterion 10. The cost study or model must deaverage support calculations to the wire center serving area level at least....

The proxy model continues to produce inaccurate estimates of lines even at the wire center level; thus, estimating costs at or below that level would produce inaccurate results.

Criterion 4. Rate of return....; Criterion 5. Economic lives and future net salvage...[for] calculating depreciation....; and Criterion 7. ...allocation of joint and common costs....

Since the HCPM2 modules do not include rate of return, depreciation, or any explicit means of allocating common and joint costs to specific services, we can not assess how well the HCPM meets these criteria. Nevertheless, given that the staff has previously recognized that expenses may be about one half of total costs, embedding the HCPM modules in the other models must be done with considerable care. As explained below, the regression approach does not meet these requirements.

4. Policy makers should not rely on the HCPM 2 estimates of universal service support levels.

HCPM2 is still only a partial model that cannot be fully assessed at this time because it: (1) does not incorporate usage investment (switching, transmission, signaling); and (2) does not make the calculations needed to generate monthly expenses for depreciation, cost of money, maintenance, repair, etc. In an effort to provide some sense of the fund size implied by their model, the FCC staff tries to overcome these limitations by using a regression based on BCM2 data. This approach does not provide reliable support for policy decisions. Thus, the \$10.1 billion fund size estimate cannot be used to support any arguments regarding the need for federal or state funds. More specifically:

- The FCC staff estimates of universal service fund are based on a regression that forecasts BCM2 estimated monthly costs per line as a function of BCM2 estimates of lines and loop investment per line. Although the regression may forecast BCM2 estimated monthly costs per line accurately based on BCM2 estimates of lines and loop investment per line, this does not imply, as the FCC staff argues, that “we may reliably use this indirect calculation in order to predict aggregate support levels under the hybrid model approach.”
- First, it suffers from a fundamental conceptual flaw: the BCM2 estimated investment per line is not the same as HCPM 2 estimated investment per line. Thus, applying an equation, estimated from BCM2 data, that relates BCM2 total cost per line to BCM2 estimates of lines and loop investment per line to estimate total costs based on HCPM 2 estimates of lines and investment per line is likely to produce misleading results. The results would be acceptable only if the now outdated BCM2 estimates of loop investment per line were highly correlated with the HCPM 2 estimates. Given the differences in the methods, this is extremely unlikely. (If they were highly correlated, then the HCPM 2 would not bring very much new to the table.) If they are not highly correlated, it is not reasonable to expect that the relationship between total monthly costs and loop investment would be the same for the BCM2 estimates as they would be for the HCPM 2 estimates. For example, the FCC model may produce different mixes of copper, T-1 and fiber facilities as well as different routes for the facilities, and different mixes of structure; thus, the cost of maintaining its plant could be quite different from the costs of maintaining the plant produced by the BCM2.
- Second, the data in BCM2 are outmoded, and the FCC staff found a number of problems with that model. For example, in assessing BCM2 and Hatfield 2.2.2, they stated:

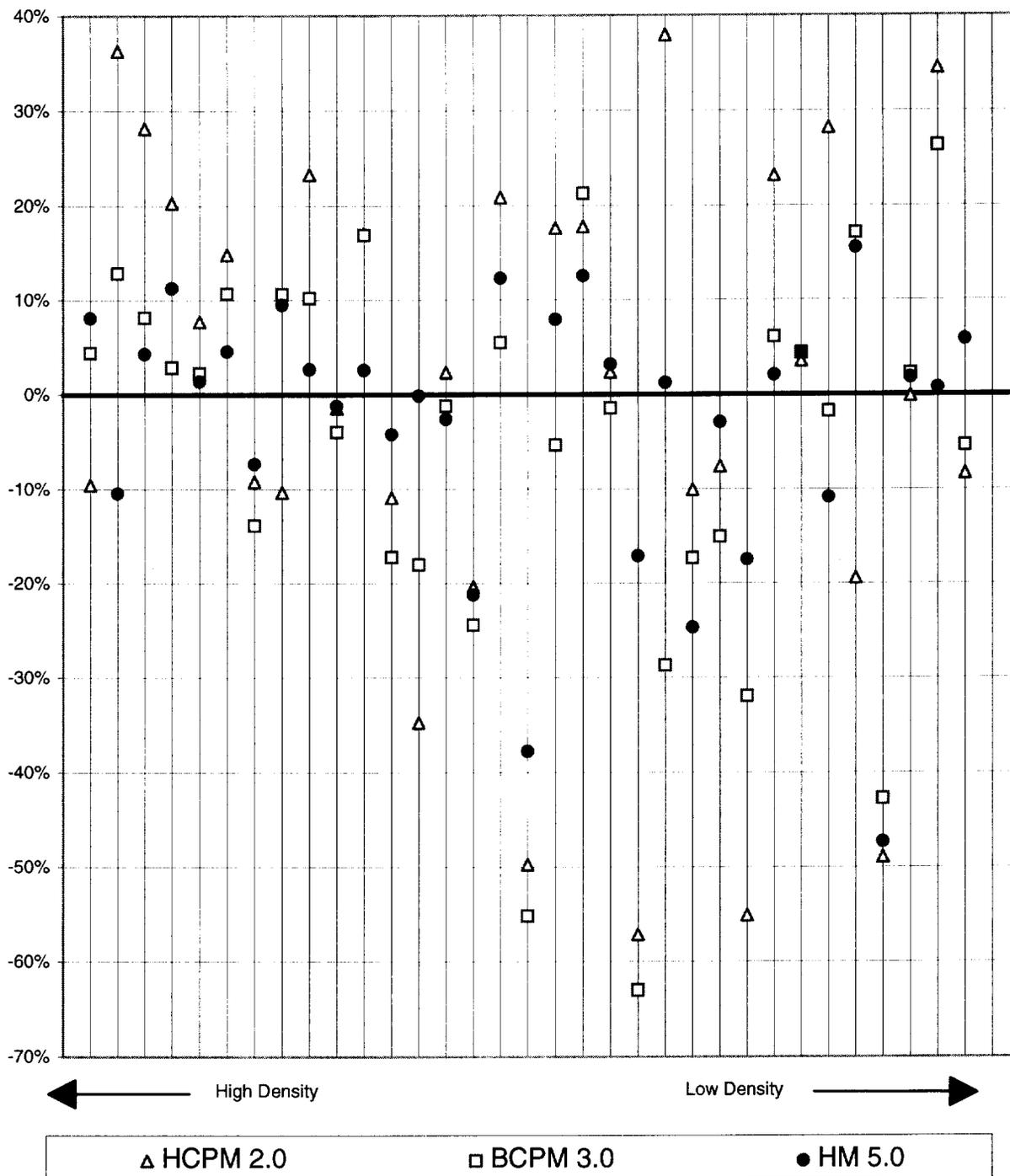
On the expense side, we believe further study is required to determine the appropriate forward looking cost of capital and rates of depreciation. We also believe that model proponents should further refine the methodologies that current models use to estimate forward-looking operating expenses. Since these expenses may comprise... over one-half of the total costs of network elements or

supported services, we believe that additional supporting studies of non-capital expenses by model sponsors and outside parties would be desirable.²

Thus, unless the FCC staff has refined the BCM2 model—an unlikely possibility—use of the BCM2 model cannot produce useful results for estimating the size of the switching costs and expenses that must be added to the loop investment produced by the HCPM.

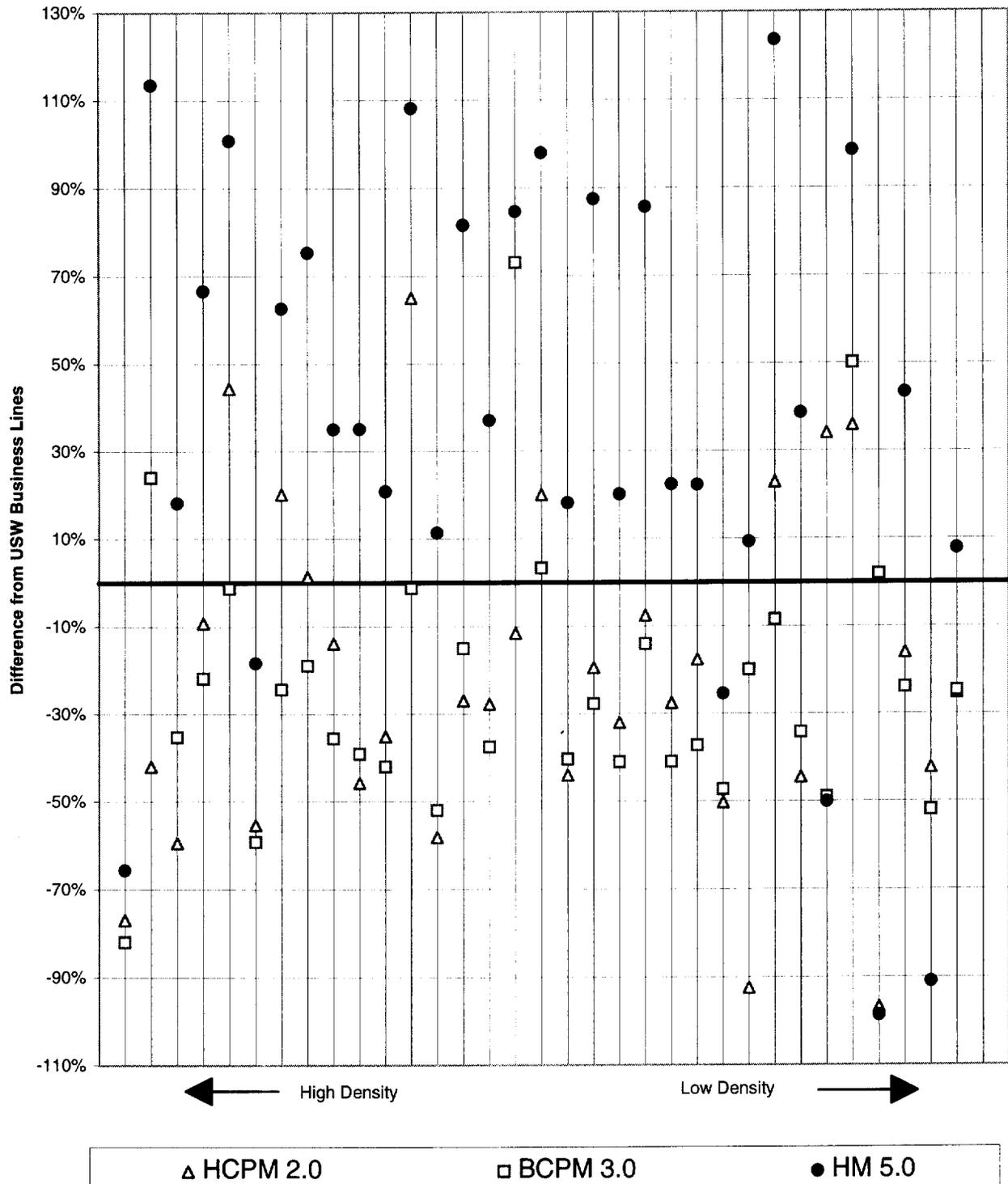
² J. Atkinson, C. Barnekov, D. Konuck, W. Sharkey, "The Use of Computer Models for Estimating Forward-Looking Economic Costs," January 9, 1997, para. 73.

**Percent Difference from Actual Residence Line Count by Wire Center
USWest - Colorado**

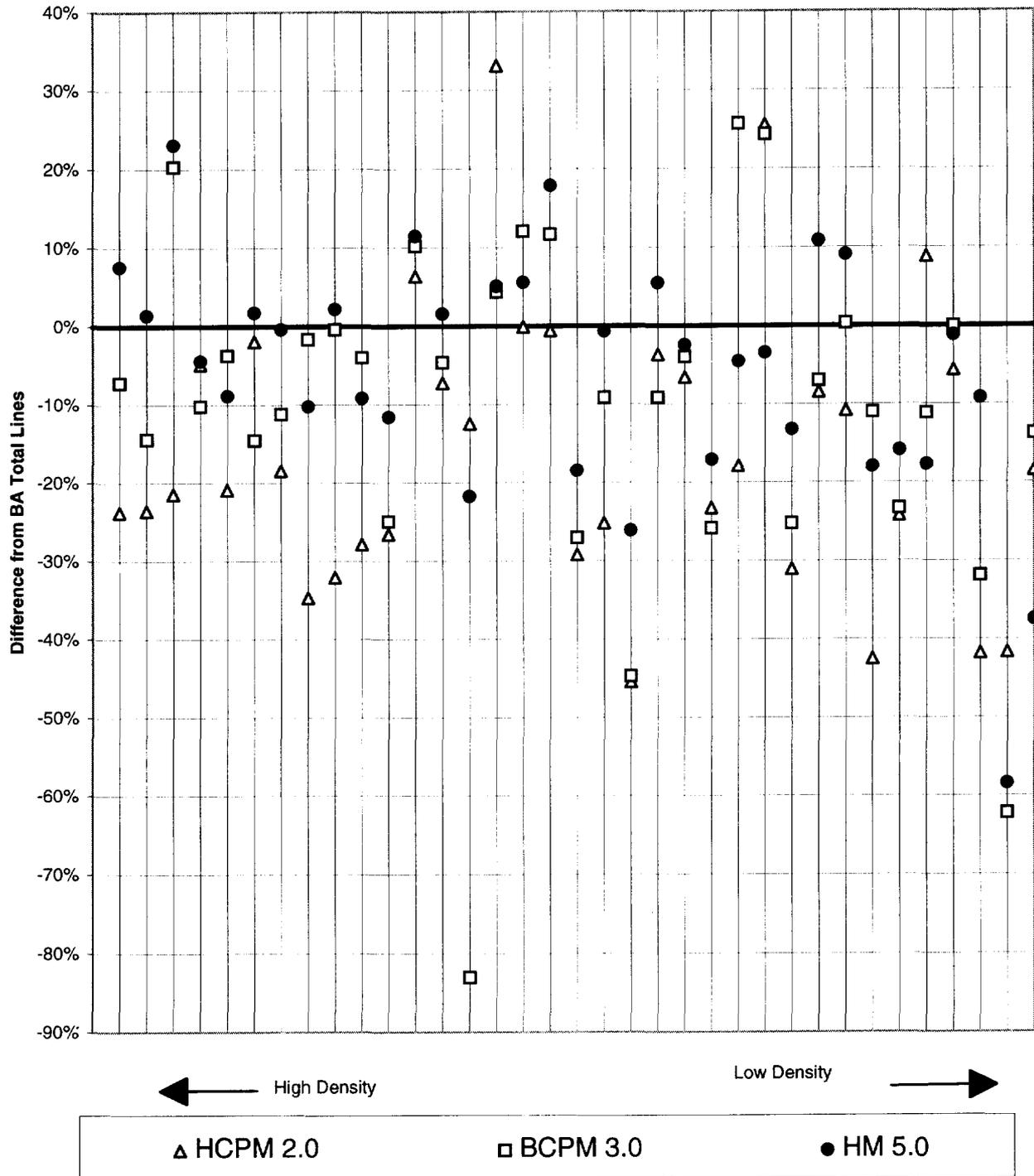


NOTE: We omitted the ENWDCOAB wire center, due to an error of 304% for HCPM 2.0, to allow for a more accurate depiction of errors for the other wire centers. We omitted ENWDCOMA because the HCPM 2.0 did not generate any output for that wire center.

Percent Difference from Actual Business Line Count by Wire Center USWest - Colorado

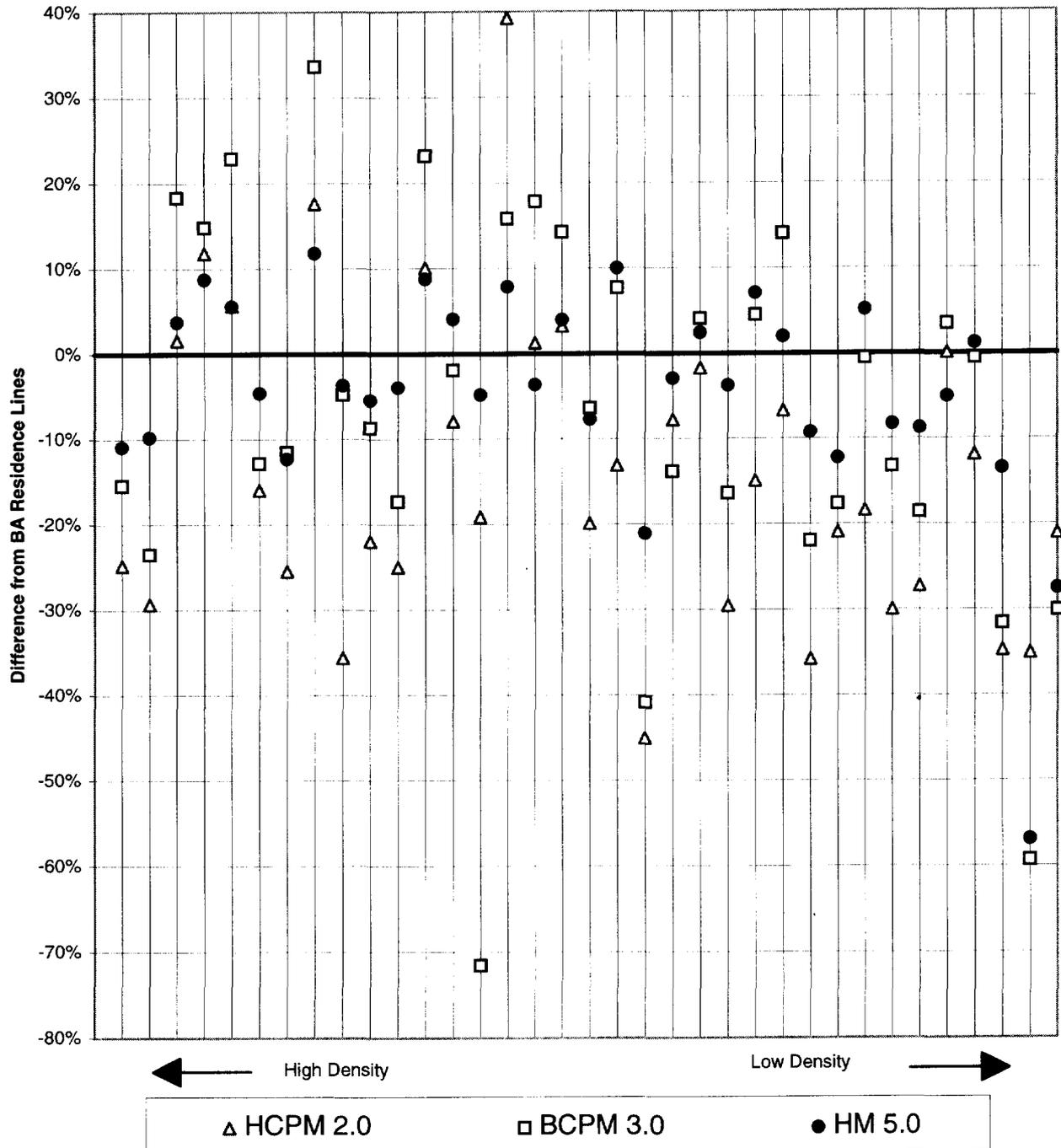


**Percent Difference from Actual Total Line Count by Wire Center
Bell Atlantic - New Jersey**



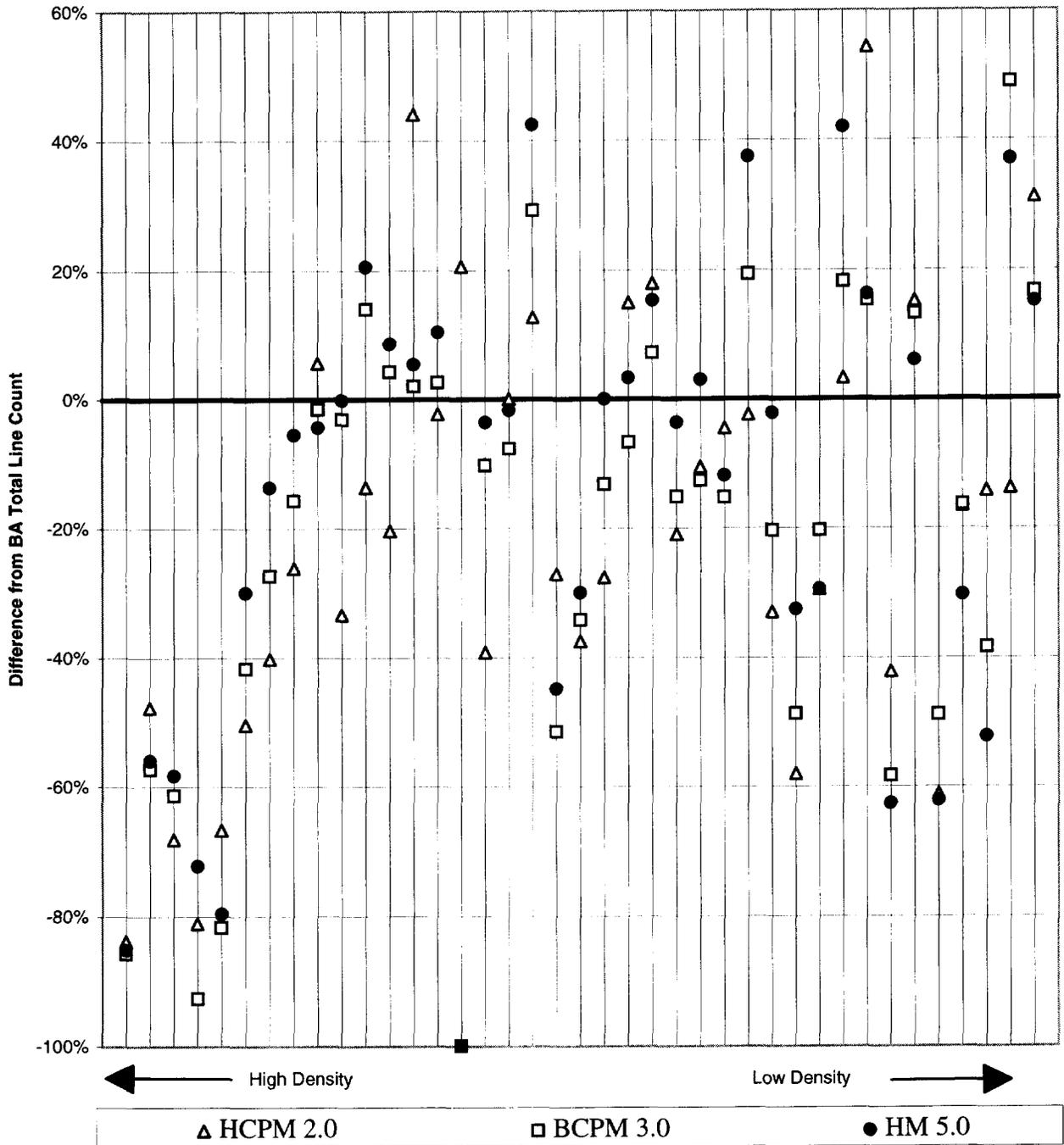
NOTE: We omitted the NBWKNJNB wire center because the HM 5.0 did not generate any output for that wire center, and we omitted CRHLNJCH because the HCPM 2.0 did not generate any output for that wire center.

**Percent Difference from Actual Residence Line Count by Wire Center
Bell Atlantic - New Jersey**



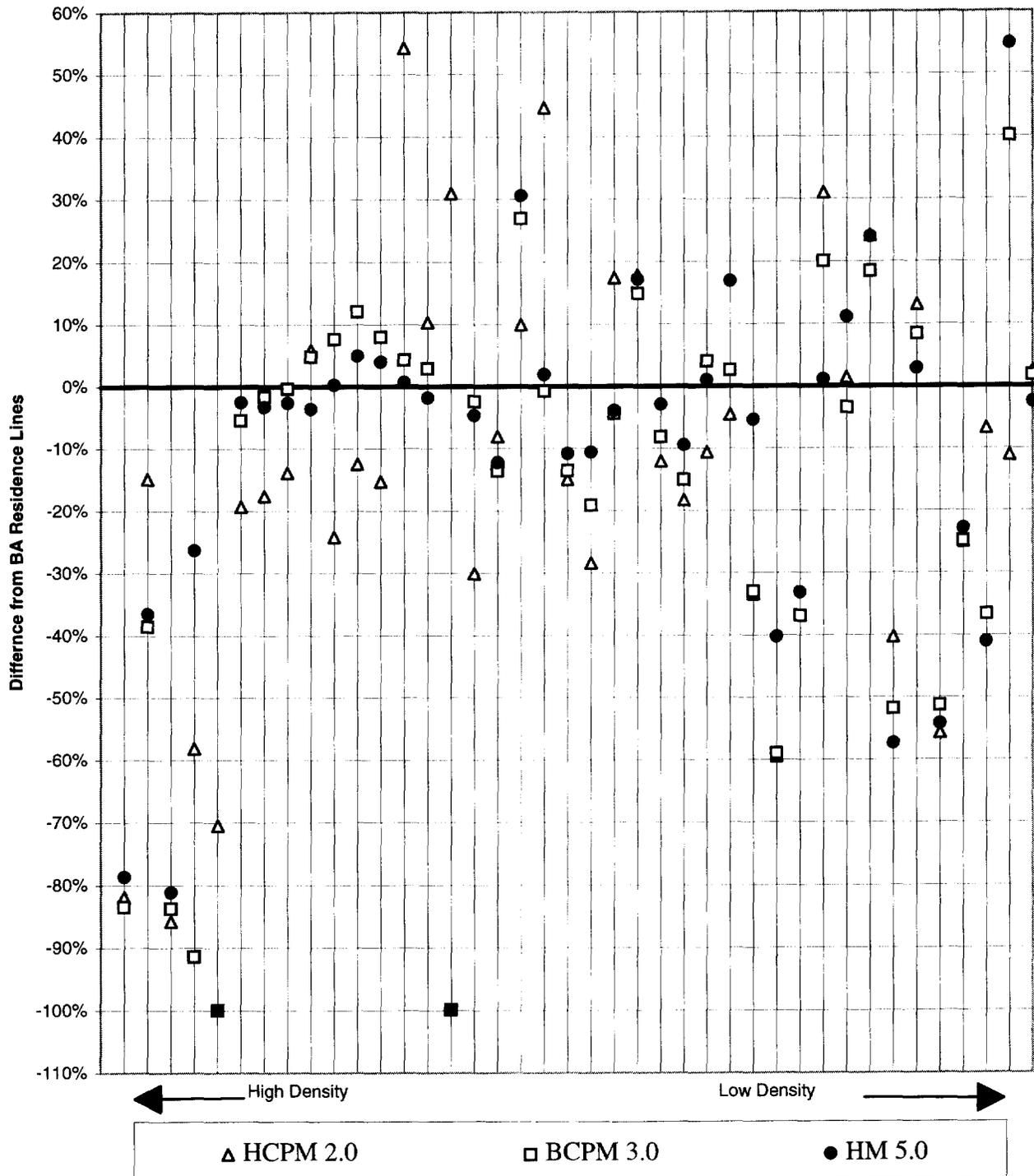
NOTE: We omitted the NBWKNJNB wire center because the HM 5.0 did not generate any output for that wire center, and we omitted CRHLNJCH was also omitted because the HCPM 2.0 did not generate any output for that wire center.

**Percent Difference from Actual Total Line Count by Wire Center
Bell Atlantic - New York**

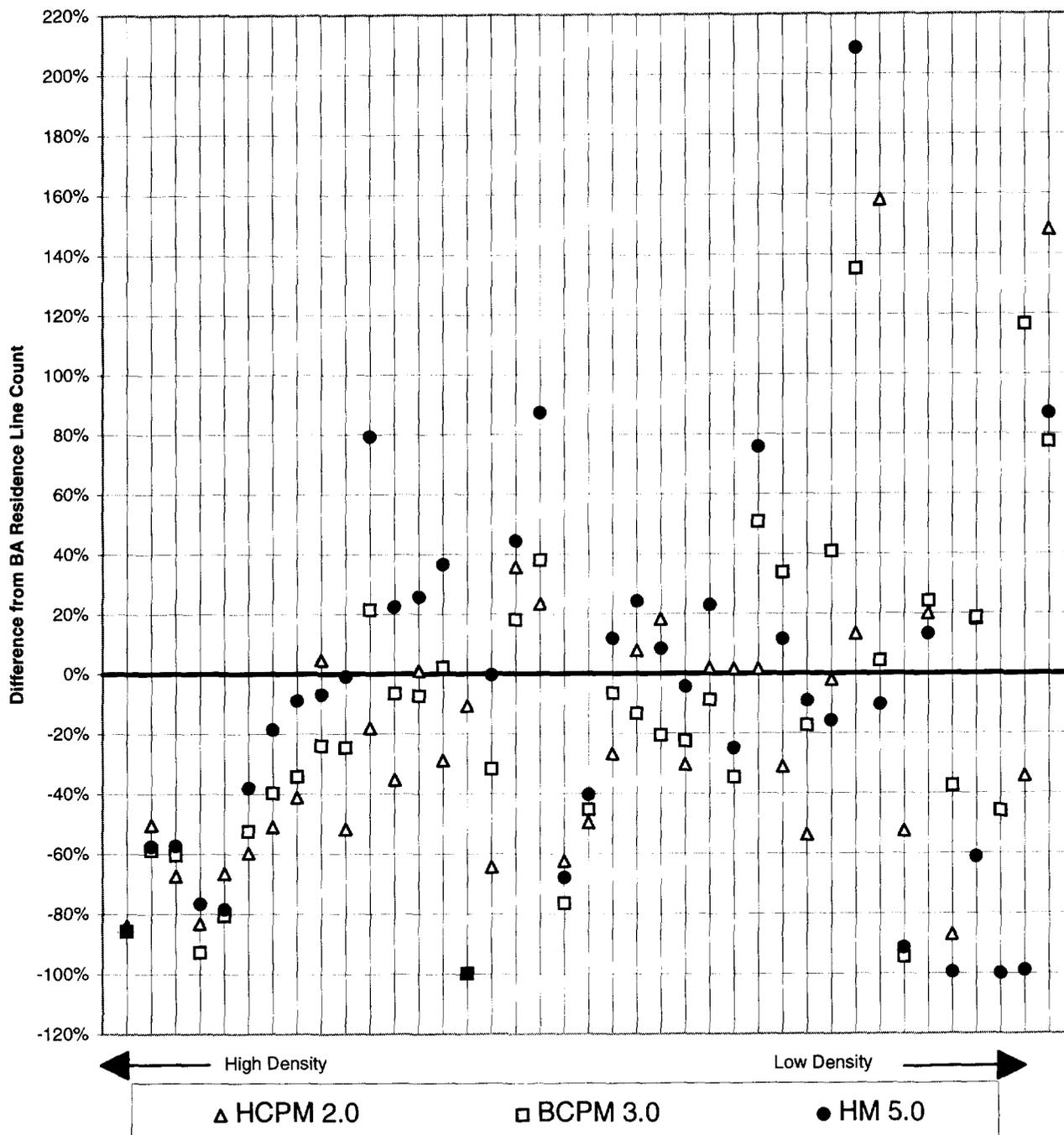


NOTE: We omitted the HHFLNYHF wire center, due to an error of 132% for BCPM 3.0, to allow for a more accurate depiction of errors for the other wire centers.

Percent Difference from Actual Residence Line Count by Wire Center Bell Atlantic - New York

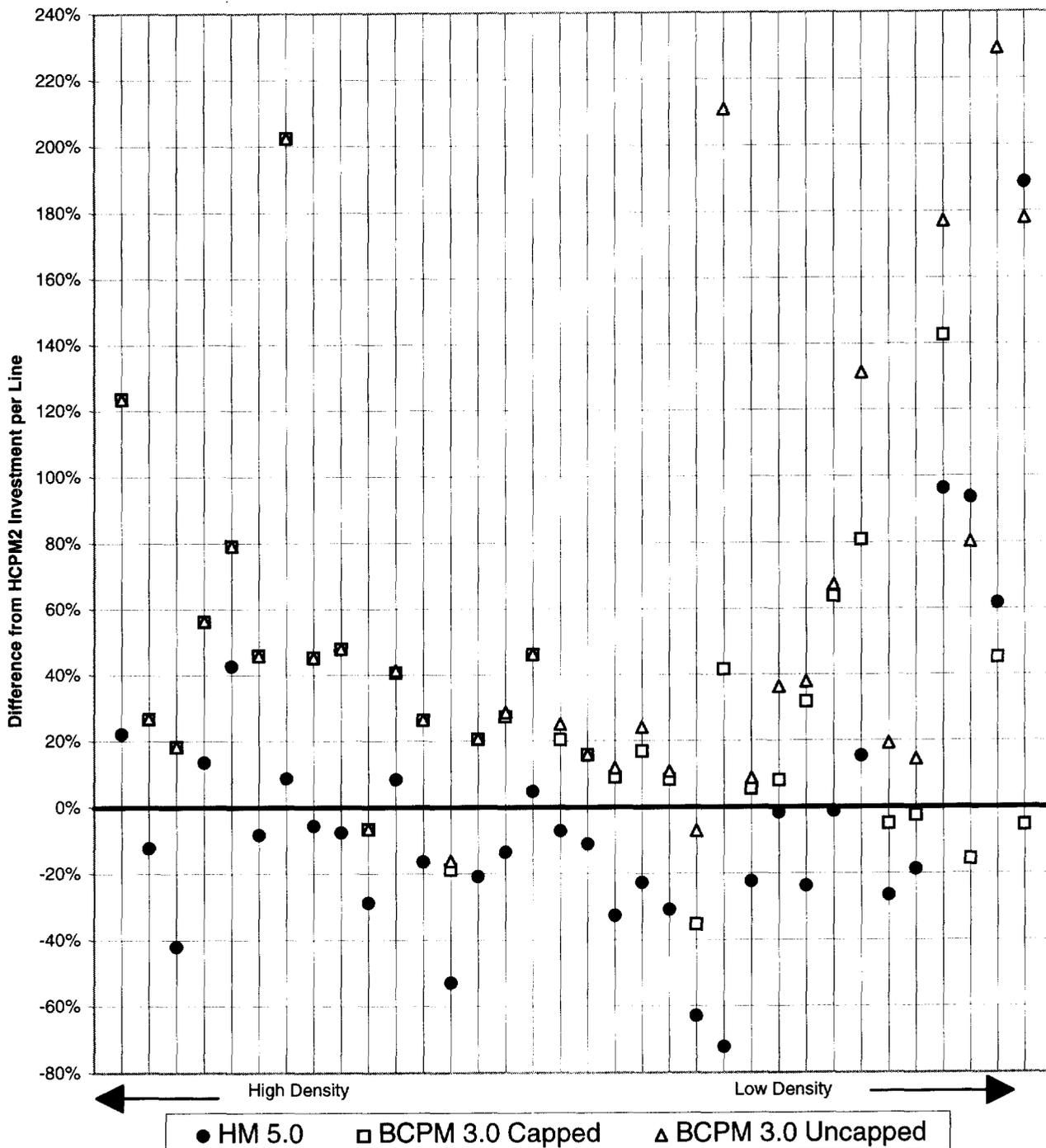


Percent Difference from Actual Business Line Count by Wire Center Bell Atlantic - New York



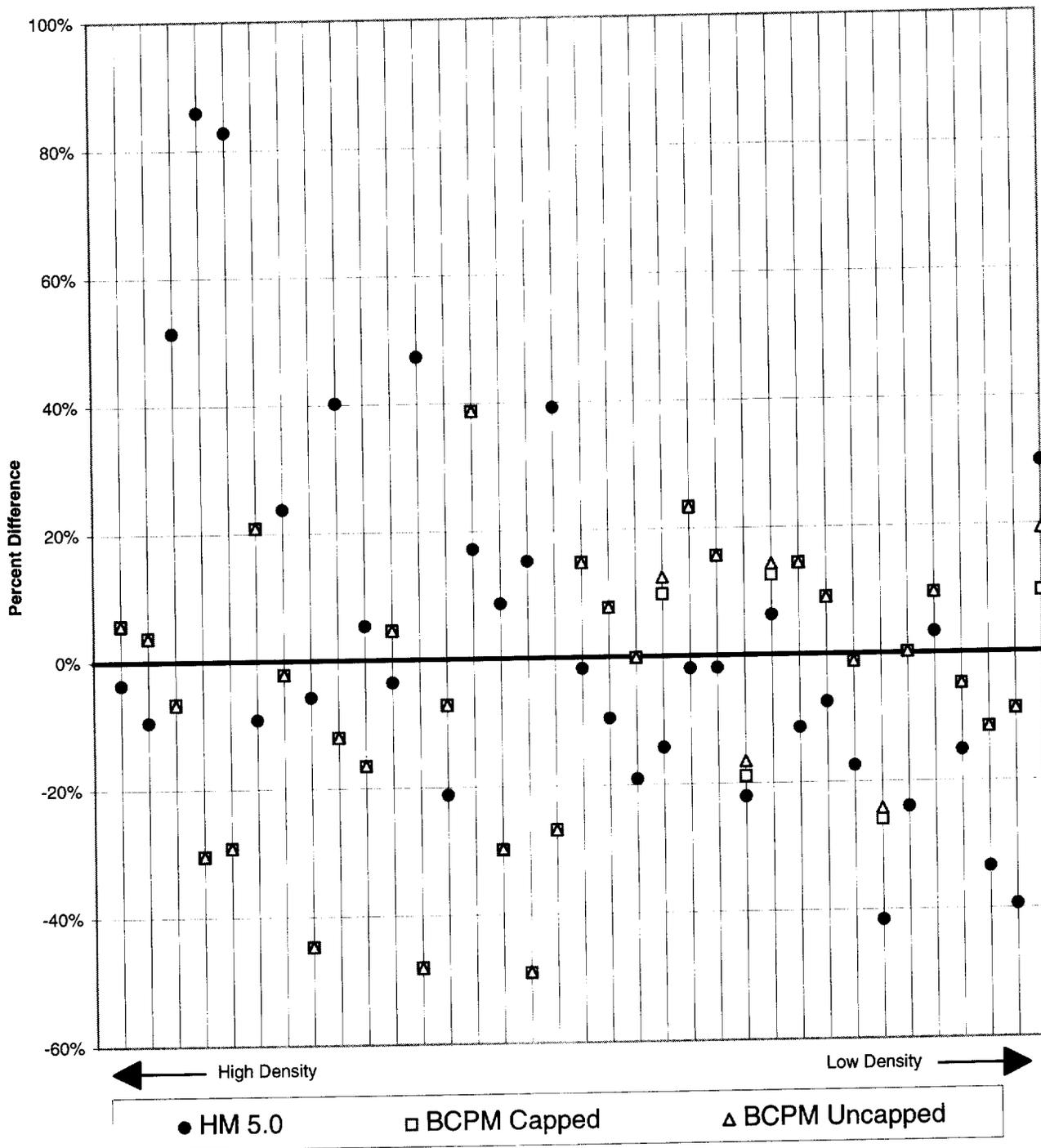
NOTE: We omitted the HHFLNYHF wire center, due to an error of 369% for BCPM 3.0, to allow for a more accurate depiction of errors for the other wire centers.

Percent Difference from HCPM2 Investment per Line By Wire Center
Colorado



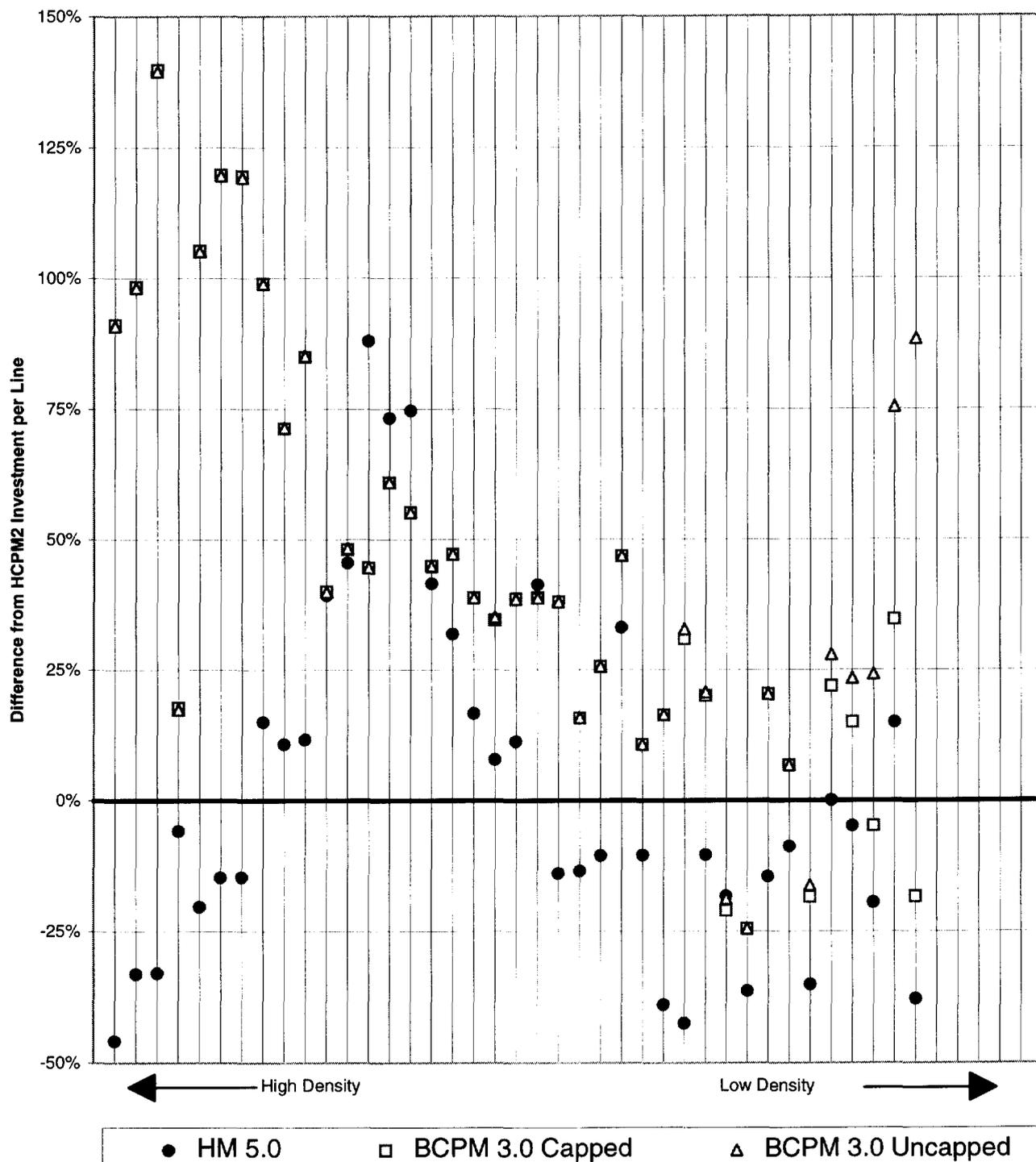
NOTE: Because the BCPM 3.0 uncapped result differed from the HCPM 2.0 result by 488%, we omitted the MEKRCOMA wire center to allow a more accurate depiction of errors for the other wire centers. The wire center ENWDCOMA was omitted because the HCPM 2.0 did not generate any output for that wire center.

Percent Difference from HCPM Investment per Line by Wire Center New Jersey



NOTE: We omitted the NBWKNJNB wire center because the HM 5.0 did not generate any output for that wire center, and CRHLNJCH was also omitted because the HCPM 2.0 did not generate any output for that wire center.

Percent Difference from HCPM2 Investment per Line By Wire Center New York



NOTE: Because the HM 5.0 result differed from the HCPM 2.0 result by 260%, we omitted the NYCXNYHO wire center to allow for a more accurate depiction of errors for the other wire centers.