Finnish Economic Papers — Volume 1 — Number 2 — Autumn 1988

ON THE TRENDS OVER TIME IN THE DEGREE OF CONCENTRATION OF WEALTH IN FINLAND*

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The aim of this paper is to illuminate the forces that may reasonably be assumed to underlie the variation observed across different wealth shares in Finland. The estimated equations, which provide a reasonable fit to the data, support, at least in a proximate manner, the views present in a simple »Meade process». The forces for equality (»popular wealth») and inequality (profits) in wealth distribution come out clearly in the empirical results.

1. *Introduction*

Has the distribution of wealth become more even during the post war period? In particular, has there been a decline in the share of the personal wealth of the top wealth holders? These are undoubtedly important questions, but they are ones which have received surprisingly little attention from economists. It is obvious that questions concerning how the concentration and ownership of wealth has changed over the years have not been primary concerns in the profession, in fact far from it. There are very few theories about wealth distribution, and equally few attempts to test how well these theories match the evidence.

Initially, this paper was concerned with the development of the distribution of wealth during the period 1950—1983 in Finland. However, for reasons of data consistency, the analysis of factors assumed to be relevant to the development of wealth distribution only covered the period 1968—1983.

In common with many other countries, knowledge about the distribution of personal wealth in Finland is far less detailed than knowledge about personal income. Thus, this lack of accurate (and reliable) distributional information raises the important question of the method of estimating wealth distribution. Roughly speaking, there are four methods of deriving estimates of wealth distribution. Perhaps the most commonly used one is the estate multiplier method[1] which treats the dead as a random sample of the living. Usually, although not necessarily, this method is built on the practice, prevailing in a country with estate taxes but no annual wealth tax, that the only occasion when a person's (or family's) total assets and liabilities are revealed to the tax authorities is when he dies.

The second method is the so-called investment income method. This starts from data on investment income collected by the tax authorities, and works back from there to the

* *This is part of the project on the distribution of personal wealth in Finland, supported by the Academy of Finland.*

** *We are grateful to Professor A. Atkinson and Dr. J. Pekkarinen for useful comments on this paper. Skillful computational assistance was provided by J. Kontulainen.*

[1] *See Atkinson and Harrison (1978) for a detailed exposition of this method.*

capital generating the income stream. There are a number of reasons, mainly concerned with the high level of uncertainty why this particular method should not be applied to Finland, not least the high level of indebtness.

The third and most direct method is the sample survey. The attraction of sample surveys is that they provide direct information on wealth among the living population. In countries such as Finland, with annual wealth taxation, this sample can be drawn from tax files[2]. However, such a sample survey has been carried out only once in Finland (Pekkarinen, Takala, Tuomala 1985).

Naturally, we cannot use wealth information from that cross-sectional study for the purposes of this paper. Fortunately, in Finland information is available which gives rise to a fourth, and favoured, method of estimation. Namely, the Central Statistical Office publishes annual Income and Wealth Statistics. These statistics are derived from annual wealth tax information. The official statistics are deficient in a number of respects, e.g. assets are valued according to so-called tax values. We think, however, that estimates of the personal wealth shares of the top wealth holders derived from these statistics are much more valuable than many people are willing to admit. We believe that they provide a good starting point to the analysis of time series. Published wealth statistics cover everyone liable to taxation. The data is presented in a grouped form and the information available for each interval is the number of people and total wealth cumulated during the interval. In this form the data covers the period 1950—1983.

The distribution of wealth (or estimates thereof) may summarized in a number of ways. One of the most common is to calculate wealth shares associated with different percentile strata: e.g. top (richest) 0.1 %, the next 0.9 % and the next 9 %. When the distributional information is presented in a grouped form, the problem of *interpolation* of the required percentage points becomes acute. A variety of parametric methods has been developed to estimate these points from the grouped wealth data. For this paper we used a third-order polynomial function in interpolating specific Lorenz-curve points (see the appendix for a more detailed exposition). We investigated existing evidence about changes in the concentration of wealth and chose the series for 1968—1983, which is closest to being commensurate over time. The need for a consistent series of estimates is obvious. There are, however, serious problems in the construction of such a series, largely associated with the data base at hand, and especially its invariance over time. Wealth statistics have been published for many years, but their form and coverage have changed on a number of occasions. This has been the most important reason for restricting the sample period to the years 1968—1983. Even though, practically speaking, the form and coverage of the statistics have not changed during those years, there are still a number of issues which cloud estimation based on them and which ought to be clarified at the outset. First, there is the distinction between tax values and market values. Some encouraging evidence is provided by Pekkarinen, Takala and Tuomala. According to the partial corrections they made to the tax values, the share of the top wealth holders (in 1981) is practically speaking invariant with respect to the transformation of tax values to market values.

Secondly, due to its composition, the wealth of the top wealth holders is to a large extent accounted for in Finnish annual wealth tax returns. This is important from the point of view of the basic hypothesis governing our estimation, since in order to be representative, different wealth items should be well accounted for by the data.

Thirdly, there is an intrinsic problem in valuing housing wealth. According to the tax law applied by the tax authorities, the tax value of houses should follow their market value. To our minds, this is not entirely reliable, especially for the early 1970's. Unfortunately, this highly important source of bias cannot be checked on the basis of our statistics. Since 1976, however, information about the composition of wealth is available. On the basis of this information, it seems that tax values are fairly well indexed.

The structure of this paper is as follows. Section 2 presents the percentage shares of the top wealth strata: the top 0.1 %, the next 0.9 % and the next 9 % (Table 1 and

[2] *Spånt (1980) provides a good example of this method.*

Table 1. Top wealth-shares in years 1968—83.

Year	TOP 0.1 %	TOP 1 %	TOP 10 %	SECOND 0.9 %*	THIRD 9 %**
1968	0.1350	0.3197	0.7299	0.1847	0.4102
1969	0.1287	0.3261	0.7327	0.1974	0.4066
1970	0.1237	0.3107	0.7387	0.1870	0.4280
1971	0.1249	0.2916	0.7081	0.1667	0.4165
1972	0.1178	0.2825	0.6986	0.1647	0.4161
1973	0.1198	0.2732	0.6826	0.1534	0.4094
1974	0.1269	0.2619	0.6717	0.1350	0.4098
1975	0.1079	0.2392	0.6602	0.1313	0.4381
1976	0.0957	0.2064	0.6435	0.1097	0.4381
1977	0.0899	0.1923	0.6468	0.1024	0.4545
1978	0.0854	0.1864	0.6421	0.1010	0.4557
1979	0.0805	0.1767	0.6345	0.0962	0.4578
1980	0.0826	0.1630	0.6317	0.0804	0.4687
1981	0.0845	0.1755	0.6356	0.0910	0.4601
1982	0.0883	0.1765	0.6386	0.0882	0.4621
1983	0.0901	0.1757	0.6351	0.0856	0.4594

* From 0.1 % to 1 % of the population below the top 0.1 %.
** From 1 % to 10 % of the population below the top 1 %.

Figure 1). This evidential form is coupled with a brief discussion on the basic features of the changes in observed wealth shares. Section 3 provides and discusses the empirical results of an econometric analysis aimed at explaining the observed variation in wealth shares. Finally, there is a brief concluding section.

2. *Wealth shares, 1968—1983*

The estimates in Table 1 and Figure 1 provide a clear indication of a downward trend in the shares of the top wealth holders. From 1970 to 1977, the share of the top 1 % appears to have fallen quite substantially. This is not the case, however, for groups below the very top. Although the share of the top 0.1 % has fallen from 13.5 % (1968) to 8 % (1979), the share of the top 1 % to 10 % of the population below this group has risen from 41 % to 46 %.

To explain the findings (at least partially), an econometric analysis is presented in the next section. Before that, the raw material given in the second, third and fourth columns in Table 1 is transformed into three ordered wealth shares shown in the second, fifth and sixth columns. Even though the dividing line between the different percentage shares is somewhat arbitrary and contextual, the ones chosen in Table 1 do approximate well enough to the idea that there are »the very rich» and »the not so very rich» in the population, even at the top of its wealth distribution. This means, roughly, that we are seeking to verify the hypothesis that the wealth generating process differs between groups.

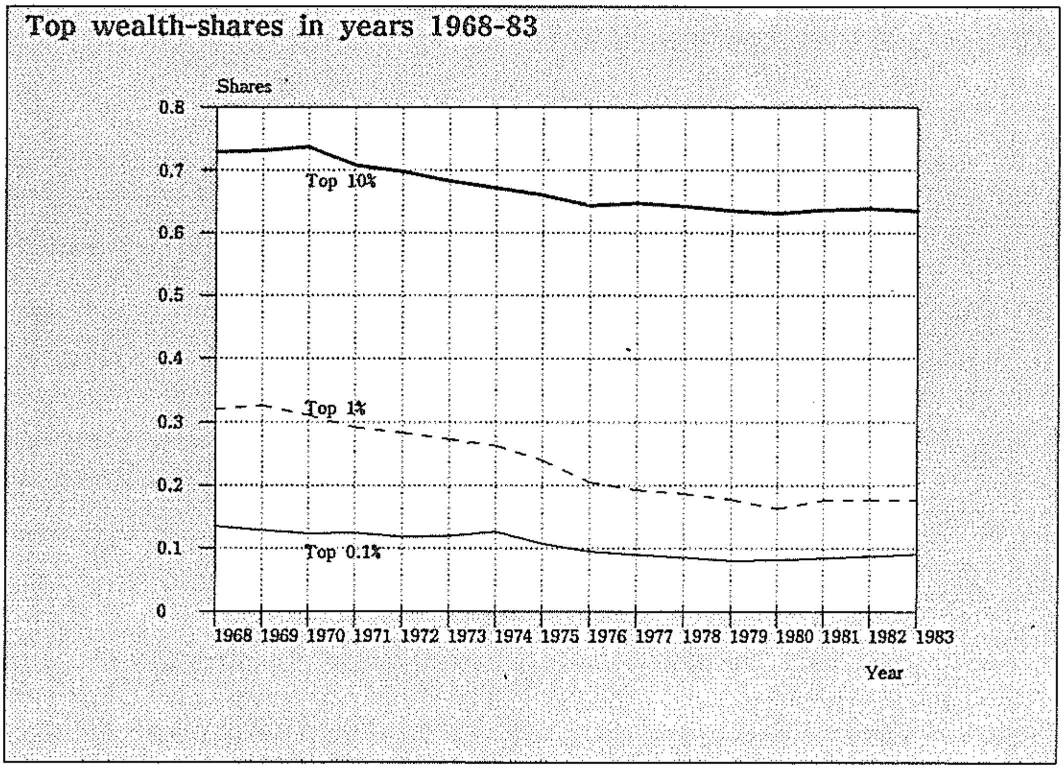
2.1. *Econometric analysis of wealth shares*

How can these observations be interpreted? What are the forces underlying the development presented in Figure 1?

In their pioneering studies using British data Atkinson and Harrison (1979) take a simple Meade accumulation process[3] as a starting point for their econometric analysis. They provide a very illuminating discussion of the theoretical underpinnings and a detailed derivation of the Meade process for their econometric specification. In their discussion they identify some of the principal non-equalising forces characterizing wealth accumulation. It seems that the following factors are the most important ones, at least for our purposes.

Firstly, saving from wages tends to be an equalising factor, at least below the very top of the wealth scale. For the very wealthy, earned income does not play any significant

[3] *This term is due to Atkinson and Harrison (1978).*



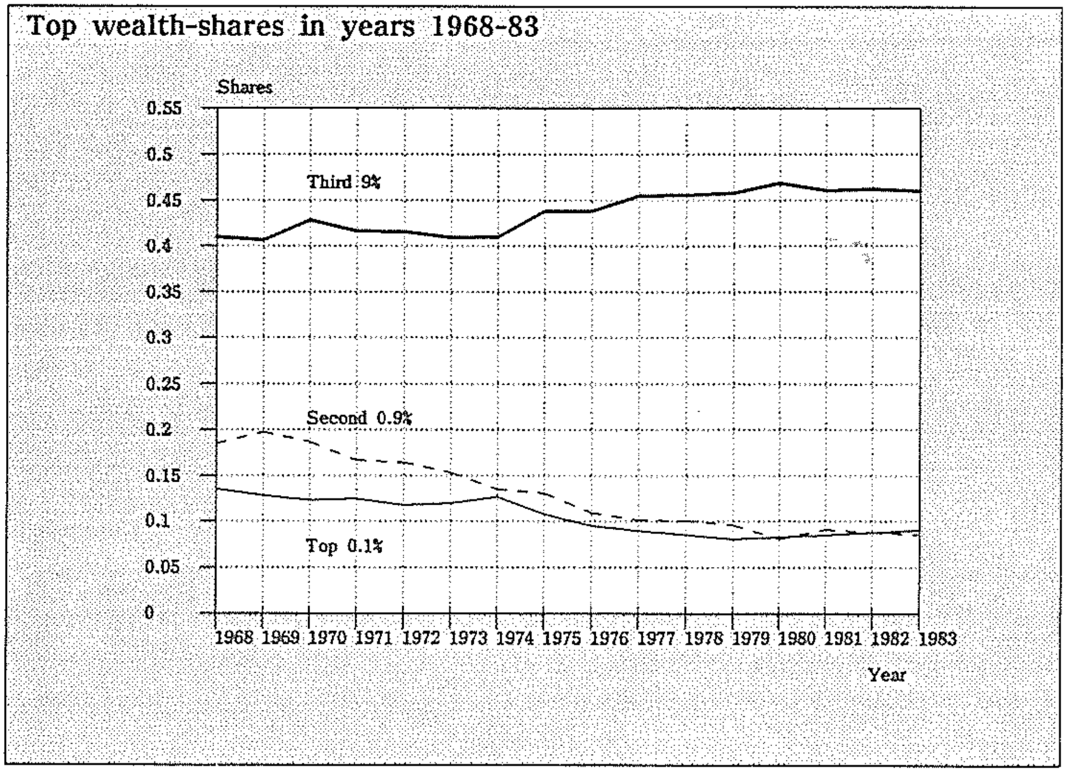


Figure 1. Wealth-shares in years 1968—83.

role in financing wealth accumulation. A general observation from the study of Pekkarinen, Takala and Tuomala seems to indicate that the top wealth holders in Finland claim a relatively large proportion of stock holdings and business assets, while investments in housing and other durable goods seem to be the dominant goals of those at the lower end of the wealth scale (something like the bottom 98 % of the distribution). For the bottom wealth stratum, the principal source of finance for these investments is saving out of wage income. There are good reasons for expecting that this factor has gained in importance with increased owner occupation, especially during the period 1960—1980.

Secondly, the internal rate of accumulation is a force for increased concentration of wealth. This is the rate at which capital tends to reproduce itself. This is represented in our empirical analysis by the net operating surplus (i.e. profits) from the National Accounts.

Thirdly, the role of taxation of wealth, especially the annual wealth tax, seems at least potentially important. Finally, various demographic determinants are likely to be relatively slow-moving. They are therefore treated as part of a general trend over the period.

The regression equation through which Atkinson and Harrison investigate the forces underlying the changes in the share of the top 1 % is in the basic form

$$(1)\quad \log W_1 = a_0 + a_1T + a_2PR \text{ (or } \log PR) + a_3PW + u$$

where W_1 is the share of the top 1 %, T denotes time trend, PR reflects the factor which takes account of saving out of »entrepreneurial profits», PW denotes the ratio of popular assets to other wealth and u is a normally and independently distributed random variable with mean zero and constant variance.

In this paper, we take from the above mentioned Atkinson-Harrison analysis a step further and extend it to other groups apart from the top 1 %. Precisely speaking, we intend to consider three different shares (or strata) in the upper tail of the wealth distribution, i.e. the top 0.1 %, the next 0.9 % and the next 9 %:

$$(W_{.1}, W_{1\text{-}.1}, W_{10\text{-}1}).$$

The reason for choosing these particular shares is a hypothesis that the wealth-generating mechanisms differ essentially between these groups of wealth holders. More precisely, we are seeking to confirm the hypothesis that there are ideally two (opposing, from the point of view of equality in a given amount of wealth distribution, at least) channels or mechanisms through which a given wealth can be generated. One channel seeks to strengthen the position of the very wealthy (and thus weaken the position of the »not very wealthy»), while the other tends to favour the lower wealth strata of a wealth distribution. In this setting $W_{.1}$ is confronted with $W_{10\text{-}1}$, while the intermediate group $W_{1\text{-}.1}$ is treated as a mixture of these two other groups (see Pekkarinen, Takala and Tuomala 1985).

The final econometric specification we arrived at for the different shares is as follows[4]

$$(2)\quad \begin{aligned} W_{.1} &= a_0 + a_1T + a_3NOS + a_4PW + a_5AWT + u \\ W_{1\text{-}.1} &= b_0 + b_1T + b_2T^2 + b_3NOS + b_4PW + b_5AWT + u \\ W_{10\text{-}1} &= c_0 + c_1T + c_3NOS + c_4PW + u \end{aligned}$$

where NOS, net operating surplus, is used to represent saving out of »entrepreneurial profits»[5] (from National Accounts), AWT denotes the »tax burden» carried by this group[6]. (The bottom group $W_{10\text{-}1}$ paid no annual wealth tax during this period.), T is time trend, T^2 denotes the rate of change of the time trend and PW (=popular wealth) is the proportion of the housing stock which is owner occupied[7].

[4] *For the sake of estimation procedure (SUR procedure) we started with a richer specification and finally ended up with the present form. The choice of the present form is mainly based on statistical considerations. It is true, as Professor Atkinson pointed out to us, that the force of the Zellner SUR procedure comes out having different right hand side variables.*

[5] *Source: National Accounts/CSO.*

[6] $AWT = \left(\frac{t\%}{w\%} - 1\right) \times$ *average tax rate, where t % is the share of the wealth tax paid by the particular percentage point, w % is the wealth share of the corresponding percentage point. Source: Income and Wealth Statistics/CSO.*

[7] *The owner-occupied variable was constructed by*

Table 2. Regression results.

	Constant	Time	Time²	PW	NOS	AWT	R^2	SEE	DW
$W_{.1}$	0.4433	2.7726		0.4571	0.3207	0.4900	0.94	0.0058	1.47
	(4.62)	(—2.77)		(—2.14)	(2.73)	(1.28)			
$W_{1\text{-}1}$	0.3128	—0.0664	0.0004	—0.6485	0.3728	0.3818	0.97	0.0087	1.99
	(1.58)	(—1.52)	(1.34)	(—0.90)	(2.22)	(0.70)			
$W_{10\text{-}1}$	—0.1958	0.0019		0.9910	—0.3395		0.86	0.0097	1.61
	(—0.99)	(1.53)		(2.69)	(—1.62)				

The disturbances for different equations, at a given point in time, are likely to reflect some common unmeasurable or omitted factors, and would be expected to exhibit some correlation. This is taken into account by the application of the technique of seemingly unrelated regressions. In the seemingly unrelated regression model introduced by Zellner (1962), the disturbances are uncorrelated over time but are correlated across equations. That is

$$(3)\quad \operatorname{cov}(u_{it}, u_{js}) = s_{ij}, \text{ if } t = s \qquad 0, \text{ if } t \neq s.$$

For such a model, first each equation is estimated separately by ordinary least squares, resulting in estimated disturbances $\hat{u}_{it}$. From these estimated disturbances the estimated covariances are computed:

$$\hat{s}_{ij} = (1/(T-k))\hat{u}_{it}\hat{u}_{jt}$$

where k is the number of regression parameters estimated. Finally all three equations are re-estimated jointly, using generalized least squares.

The results obtained from these equations are presented in Table 2. The coefficients of the variables are mostly of the expected sign. The statistical properties of the equations are also quite satisfactory. t-values are significant in almost all equations for the PW and NOS variables, and R^2:s are satisfactorily high in all equations (even though these statistics are slightly problematic as to their interpretation in a regression setting like this).

The first general point to make is that our empirical results do seem to support the views present in the simple Meade accumulation process. Secondly, looking next at the estimated coefficients of the owner occupation variable, the results do seem to indicate a great equalising effect of this variable. The coefficient is positive and significant in the $W_{10\text{-}1}$-equation, and negative and significant in the $W_{.1}$-equation. This was expected on the basis of the Meade accumulation process. Of the independent variables, the NOS-variable was straightforward as to its interpretation and has good statistical properties in all equations. The role of the »tax burden»-variable proved more problematic. The coefficient was (apart from being of a wrong sign) insignificantly different from zero in the $W_{.1}$- and $W_{1\text{-}1}$-equations. In interpreting these results, at least two possibilities should be considered. The first is, that the variable used in our estimation is too crude to capture the effect of the annual wealth tax and the second is, that annual wealth taxation has been of little use as a redistributive device.

using information about dwellings by tenure status and dwellings completed. Source: Statistical Yearbook of Finland.

3. Conclusions

The basic aim of the econometric analysis in this paper is to illuminate the forces that may reasonably be assumed to underlie the variation observed across different wealth shares. Our estimated equations which provide a reasonable fit to data support, at least in a proximate manner, the views present in the simple Meade accumulation process. The forces for equality (PW) and inequality (NOS) in wealth distribution came out clearly in our empirical results. We hasten to emphasize, however, that we do not pretend to have provided any definitive explanation of equality (or inequality, for that matter). A fair conclusion seems to be that our analysis does indicate certain potentialities, even if it has some weak points, not the least of which is the data base.

APPENDIX

The General Interpolation Device

The general interpolation device involves fitting a continuous differentiable function within each wealth class. In this paper we have used a third-degree polynomial function in interpolating spesific Lorenz-curve points. We shall start by presenting the structure of the data, while at the same time introducing the notation.

Let the wealth distribution $(w_1, w_2, \ldots, w_n)$, where w_i refers to the wealth of the i^{th} family (= tax unit), be presented in a *grouped form*, whose structure could be symbolized as follows

(1) $(a_0, b_0], (a_1, b_1], \ldots, (a_k, b_k]$

$f_0, f_1, \ldots, f_k$

$\mu_0, \mu_1, \ldots, \mu_k, \mu$

where $(a_i, b_i]$, $i = 0, 1, 2, \ldots, k$, is the i^{th} wealth class. (We are not excluding the possibility that $a_0 = -\infty$ and/or $b_k = \infty$. This involves fitting a Pareto-type curve to the lower and/or upper tail of the particular distribution). a_i is the *true* lower and b_i is the *true* upper limit of the i^{th} wealth class, f_i is the *relative* frequency and μ_i the class-mean of the i^{th} class, $i = 0, 1, 2, \ldots, k$ and μ refers to the general mean of the distribution. Thus

$\mu = \sum_i \mu_i f_i$ and

$\mu_i = (\sum_{j=1} w_{ij})/(nf_i)$

To continue, let $p_m = \sum_j^m f_j$ and $q_m = (1/\mu) \sum_j^m \mu_j f_j$. Thus p_m is the proportion of units receiving wealth less than or equal to b_m (cumulative sum of relative frequencies up to b_m, i.e. »empirical» cumulative distribution function from grouped data) and q_m is the cumulative proportion of wealth received by the p_m wealth units (also called the cumulative distribution function of »monies»). *Lorenz-curve* is a set of points consisting of the pairs (p, q). The slope of the Lorenz-curve is given by

(2) $$\frac{dq}{dp} = \frac{w}{\mu}$$

where w is a particular point on the curve.

Consider a polynomial of the third degree to represent the Lorenz curve within each wealth class except the first and last class. The densities in these classes are constructed by imposing a Pareto-type representation upon the density function of these classes. Thus let the polynomial for the m^{th} class be

(3) $$q = a_{0m} + a_{1m}(p - p_{m-1}) + a_{2m}(p - p_{m-1})^2 + a_{3m}(p - p_{m-1})^3$$

where a_{0m}, a_{1m}, a_{2m} and a_{3m} are parametres to be determined. Because the end points (p_{m-1}, q_{m-1}) and (p_m, q_m) lie on the Lorenz curve, they should satisfy (3). Substituting (p_{m-1}, q_{m-1}) and (p_m, q_m) into (3) yields

(4) $$a_{0m} = q_{m-1}$$

(5) $$\Delta q_m = a_{1m}(\Delta p_m) + a_{2m}(\Delta p_m)^2 + a_{3m}(\Delta p_m)^3$$

where $\Delta q_m = q_m - q_{m-1}$ and $\Delta p_m = p_m - p_{m-1}$.

Using the facts $\Delta p_m = f_m$ and $\Delta q_m = \mu_m f_m/\mu$ equation (5) can be written as

(6) $$(\mu_m/\mu) = a_{1m} + a_{2m} f_m + a_{3m} f_m^2.$$

Differentiating (3) with respect to p yields

(7) $$(dq/dp) = a_{1m} + 2a_{2m}(p - p_{m-1}) + 3a_{3m}(p - p_{m-1})^2.$$

And thus with (2)

(8) $$(w/\mu) = a_{1m} + 2a_{2m}(p - p_{m-1}) + 3a_{3m}(p - p_{m-1})^2$$

$p = p_{m-1}$ and $p = p_m$ together imply that $w = b_m$ and $w = b_{m-1}$, which yield from (8)

(9) $$(b_{m-1}/\mu) = a_{1m}$$

(10) $$(\Delta b_m/\mu) = 2a_{2m} f_m + 3a_{3m} f_m^2.$$

Solving equations (4), (6), (9) and (10) for the a's yields

(11) $$a_{0m} = q_{m-1}$$

(12) $$a_{1m} = (b_{m-1}/\mu)$$

(13) $$a_{2m} = (\Delta b_m)(3\delta_m - 1)/(\mu f_m)$$

(14) $$a_{3m} = (\Delta b_m)(1 - 2\delta_m)/(\mu f_m^2)$$

where $\delta_m = (\mu_m - b_{m-1})/(\Delta b_m)$ and $\Delta b_m = b_m - b_{m-1} = b_m - a_m$.

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