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Revisions to User Costs for the Federal Reserve Bank of St. Louis Monetary Services Indexes

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Abstract

This analysis discusses two changes to the user costs that are part of the Federal Reserve Bank of St. Louis monetary services index numbers (MSI) database. First, we introduce an alternative splicing procedure, robust to differences in scale between series, for those price sub-indexes which, individually, have a time span shorter than the overall MSI but are spliced to span the entire period. Second, we correct an error in the calculation of user costs for money market mutual funds which caused the user costs to be based, for a considerable period of time, on the last-reported value for one input data series. The revised data also restore the yield-curve adjustment for composite assets, removed last year as we explored unusual behavior of the user cost data.

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1. Introduction

The Federal Reserve Bank of St. Louis has published monetary index numbers (often referred to as Divisia monetary aggregates) since the 1980s. In a set of papers, Anderson, Jones and Nesmith (1997a,b,c) published a major revision and extension of the Federal Reserve Bank of St. Louis monetary services indexes (MSI). A significant feature of that extension were new user costs for the MSI, based on an expanded collection of historical data and updated procedures for building user-cost index numbers.

Here, we discuss two recently implemented revisions to the MSI user costs:

- First, we introduce an alternative index-number splicing procedure. For some monetary assets, data are available to measure user costs only for intervals shorter than the interval of the overall index. In these cases, indexes for the individual periods are spliced to create a user cost measure that spans the quantity data's longer observation interval. In Anderson et al. (1997c), a geometric-mean formula (similar to the geometric mean used to create unilateral index numbers) is used to splice these sub-indexes. At that time, the geometric mean formula produced (apparently) acceptable indexes. During recent years, however, the scaling (normalization) in that method suggested to some users of the St. Louis MSI that small time deposits had negative own rates of return. Here, we replace that splicing method with a procedure proposed by Hill and Fox (1997), also based on geometric means. This primarily affects small-denomination time deposits.

- Second, we correct a programming error which caused one user cost—for money market mutual funds—to be based, for a considerable period of time, on the last-reported value for its own-rate input data series. We also improve, perhaps slightly, the accuracy of the MSI by introducing separate user costs for general-purpose/broker-dealer and for institutional money market mutual funds.

The changes implemented as of the date of this analysis (May 19, 2005) also include restoring the yield-curve adjustment to the calculation of user costs for composite assets; see the appendix for details. The yield curve adjustment was removed from calculation of user costs during 2004 as we explored the causes of unusual behavior in the user costs for small-denomination time deposits. Our experiments, reported herein, concluded that the yield curve adjustment, even during a period with very low maturity-based spreads between short- and long-term deposit offering rates at banks, was not distorting the user costs.

2. Unilateral Index Numbers and Splicing Time Series

In an ideal world, index numbers would always be built from flawless sets of matching price and quantity data that span the complete desired time interval. In the real world, building index numbers requires methods to handle missing and/or incomplete data. Two of the more common methods are *unilateral index numbers* and *splicing*.

A *unilateral index number* is an index number constructed from either price or quantity data, but not both—that is, an index number constructed in the absence of one type of data. Because quantity data are more expensive to collect than price data, available price data often are more detailed than corresponding quantity data. In such circumstances, it is desirable to combine the price data into an index which matches, in its level of aggregation, the available quantity data. Such indexes are known as unilateral price indexes, a label due to Diewert (1995). In the index-number literature, unilateral indexes often arise in the case of "low-level" aggregation. In low-level aggregation, the data often are repeated observations in a panel-data structure, that is, repeated observations of a single product's price on different dates at, say, a number of retail outlets. Most often, quantity data—such as the quantity sold at each outlet—is not recorded. A common textbook example is the price of toothpaste, which often is collected at a large number of discount and drug stores without corresponding store-by-store sales data.

A distinctly different operation is *splicing* index numbers. Splicing is necessary when no single index number spans, in its date range, the entire desired time interval. (In most cases, length of the desired time interval is a judgment call by the researcher regarding the longest time span for which reasonably consistent indexes can be constructed.) For monetary data, this typically happens when one data source or survey ends and a new one begins, perhaps with an overlap of several periods.

For the MSI user costs, Anderson et al (1997c) built unilateral index numbers for a number of assets, including small time deposits, Eurodollars, and repurchase agreements. Their analysis did not separate, however, the construction of unilateral price indexes from the problem of splicing price indexes. The primary focus of this analysis is to examine circumstance in which this decision matters importantly for interpreting the indexes.

A. Unilateral Index Numbers

A *unilateral index number* is an index constructed from either price or quantity data, but not both. Because these are *economic* index numbers, it is desirable that the index be interpretable within an economic aggregation or demand theory framework. To do so for price indexes, certain necessarily un-testable assumptions must be made regarding properties of the demand functions for the unobserved quantity data. There are two common alternatives: either that the goods have infinite cross-price elasticities (perfect substitutes in demand), or that they have unitary cross-price elasticities (constant expenditure on the goods included in the sub-aggregate). Anderson et al (1997c) accept an argument advanced by Erwin Diewert that the latter is the more reasonable, albeit also the less common. An implication of this assumption is that the unilateral price indexes should be constructed as a Jevons-style geometric means, in which the growth rate of the index equals the growth rate of the ratio of the current period's geometric mean divided by the geometric mean in the previous period.

Readers are cautioned that the term “unilateral” has been used with alternative meanings in other index number discussions. Barnett (2005), for example, uses the term to refer, in a multi-country index number framework, to an approach in which there exists a single representative agent who is indifferent to his country of residence. This is not our context here.

To be specific, consider a unilateral price index created from own rates of return on two sets of assets. Let $\{r_{1,t},...,r_{M,t}\}$ be a vector of own rates observed on *M* assets during period *t* , and let $\{r_{1,t-1},...,r_{S,t-1}\}$ be a vector of own rates observed on *S* assets during a period *t-1*, where *M* need not be equal to *S*. The growth rate of the Jevons user-cost sub-index for these assets is calculated as:

$$\pi_t = \pi_{t-1}\left(\frac{\prod_{m=1}^{M}(\pi_{m,t})^{(1/M)}}{\prod_{s=1}^{S}(\pi_{s,t-1})^{(1/S)}}\right), \tag{1}$$

where $\pi_{m,t}$ is the real user cost of the monetary services received during period *t* from the *m*-th monetary asset. The real user cost, in turn, is defined as

$$\pi_{it} = \frac{R_t - r_{it}}{1+R_t}, \tag{2}$$

where r_{it} is the holding-period yield between periods *t* and *t*+1 (interest being received at the end of the period) and R_t is the single holding-period yield on the benchmark asset (Barnett, 1978). The benchmark asset, in monetary aggregation theory, is an asset that (1) has zero default risk, and (2) furnishes no monetary (liquidity) services to the household during its planning period. Because such an asset does not exist in the real world, the benchmark asset often is proxied by the yield to maturity on BAA corporate bonds. Monetary aggregation theory asserts that an asset furnishes no monetary services to a household if the expected cost of converting the asset into medium of exchange during the planning period is prohibitive. Markets for lower-grade investment bonds tend to be thin and, hence, the transaction cost for speedy sale of a BAA bond likely is so uncertain as to cause the household to rank the bond at the very fringe of its continuum of monetary assets. The assumption that the benchmark asset has no default risk (that is, that the benchmark rate is nonstochastic) may be relaxed; see Barnett (1995) and Barnett and Serletis (2000, chapter 12). If asset holders are risk neutral, preferences are intertemporally separable, and all variables are replaced by their expectations, certainty equivalence applies and the yield on the benchmark asset may be replaced by its nonstochastic mean. If asset holders are risk averse, the yield on the benchmark asset is replaced by its mean minus a deterministic adjustment.

Equation (1) contains no terms to adjust the two price vectors, $\{r_{1,t},...,r_{M,t}\}$ and $\{r_{1,t-1},...,r_{S,t-1}\}$ for differences in their average level. When building unilateral indexes, it is common to assume that differences in the level of prices between (or among) price vectors are negligible. When such an assumption is not appropriate, an adjustment for scale is necessary. Adjustments for scale (level) are commonplace when splicing index numbers.

B. Splicing

Splicing index numbers is necessary when no single index spans the desired time interval. The index numbers being spliced might be of any type, including unilateral indexes. This situation most-often occurs when a data source or survey ends and a new one begins, perhaps with an overlap of several periods. Care must be exercised when the levels of the two data sources differ.

Splicing index numbers has been discussed by a number of authors:

> If the overlapping parts of the original series differ by only a scalar multiple, then the splicing problem is trivial because the two series can be combined by merely rescaling one of the series. Such an occurrence is unlikely, however, unless the two series overlap by a single observation. (Hill and Fox, 1997, p. 387)

> In practice two runs of annual index numbers may overlap by more than one year. There is then a choice: the runs may be spliced together in any one year or over an average of years in the overlap. There is generally no unique result of the application of the splicing technique. The method is empirical and approximate.
> (Allen, 1975, p. 32; quoted by Hill and Fox, 1997, p. 387).

Hill and Fox (1997) show that only the geometric mean, among the general class of symmetric means, generates a spliced series that is invariant to rebasing/rescaling of either of the original series (when appropriate scale factors are included). Hill and Fox consider splicing two time series, where one series begins in period 1 and ends in period M+N, (N > 1), while the second series begins in period M+1 and ends in period M+N+L.

Specifically, consider two index numbers which share $N > 1$ overlapping periods: x_i, $(i = 1,\ldots, M + N)$, and y_j, $(j = M + 1,\ldots, M + N + L)$. Let the spliced index be denoted $(x \sim y)_n$, $n = 1,\ldots, M + N + L$. At the first and last overlap points, the series' relative scales are $\left(y_{M+1}/x_{M+1}\right)$ and $\left(y_{M+N}/x_{M+N}\right)$. Letting the geometric mean of N arguments $a_{n,}$ $n = 1,...,N$ be denoted as $M\left(a_1,\ldots,a_N\right) = \prod_{n=1}^{N}\left(a_n\right)^{1/N}$, Hill and Fox (1997) define the spliced series as

$$(3)\qquad \begin{aligned}(x\sim y)_n &= A_1 x_n, && n=1,\dots,M\\ &= M(x_n,y_n), && n=M+1,\dots,M+N\\ &= A_2 y_n, && n=M+N+1,\dots,M+N+L\end{aligned}$$

where $A_1=\left(1/x_{M+1}\right)M(x_{M+1},y_{M+1})$ and $A_2=\left(1/y_{M+N}\right)M(x_{M+N},y_{M+N})$.

Essentially, the Hill and Fox spliced series is a scaled version of the Jevons geometric mean formula. Like many index numbers, the index is unique only up to a linear transformation. In particular, the spliced series may be rescaled further, if desired, by dividing all observations by A_1 or A_2, perhaps to preserve the level of either the first or second input series. Below, we refer to $(x\sim y)$ as the *un-normalized Hill-Fox index*, and to

$$(4)\qquad \frac{(x\sim y)}{A_2}$$

as the A_2*-normalized Hill-Fox index*. For comparison, we also discuss the A_1-*normalized* Hill-Fox index,

$$(5)\qquad \frac{(x\sim y)}{A_1}\text{.}$$

It is important, when interpreting index numbers, to note that splicing index numbers as a geometric mean is a nonlinear and non-invertible transformation. That is, the original series $\{x\}$ and $\{y\}$ cannot be recovered from the spliced series $(x\sim y)$ even if the ratios A_1 and A_2 are known. Specifically, for own rates of return and users costs in the St Louis MSI, the own rate of return, benchmark rate, and user cost no longer are related, after splicing, via the simple formula

(6) *user cost = benchmark_rate – own_rate*.

This is illustrated below for small time deposits.

In previous versions of the St. Louis MSI (Anderson et al, 1997), unilateral index numbers were spliced via a geometric mean formula similar to the Jevons index shown in equ (1), and normalized by setting its value during the first period in which both series exist equal to the geometric mean of the that period's user costs, that is, dividing by A_1. (This formula differs from the A_1-normalized Hill-Fox because the factors A_1 and A_2 are not used in building the index prior to normalization.) Because the input data series were of different magnitudes, the resulting spliced user costs exhibited some undesirable properties. The most serious problems were for small-denomination time deposits, which are examined in the next section. In this revision, we accept the argument that normalizing the index to the *final* period in which both series are defined creates a more easily understood series.

3. User Costs for Small-Denomination Time Deposits

Creating index numbers for small-denomination time deposits is troublesome due to the lack of appropriate disaggregate data. For quantity data, the Federal Reserve collects the total amount of small time deposits held by depository institutions—but without any data regarding either the original maturity or remaining time to maturity. For deposit rates, the Federal Reserve collects rates offered by depository institutions on new deposits for five maturities (7 to 91 days, 92 to 182 days, 183 days to 1 year, 1 year to 2.5 years, and 2.5 years or more)—but no data on the distribution of actual rates being paid, and no data on the volume of new deposits issued at each rate. Because of these data limitations, the construction of highly accurate user cost and maturity-related quantity indexes is impossible. The St Louis MSI are not the first monetary aggregates to suffer from these data limitations. Inadequate data also lie behind, at least in part, the well-known inability of researchers in empirical monetary economics to estimate a stable linear demand functions for small time deposits. Typical of studies are Moore, Porter and Small (1990) and Carlson et al. (2000). Some other studies, using certain flexible functional forms, have obtained different results. Fleissig and Swofford (1996), for example, find a very stable own price elasticity of demand for small denomination time deposits near [negative] unity from 1970 to 1993 (see their figure 1, p. 375). Fisher and Fleissig (1997) find an acceptable pattern of time-varying Morishima cross-elasticities of substitution among three monetary sub-aggregates: transactions money, including currency and household checkable deposits; savings deposits; and small time deposits.

Data problems for small time deposits are further complicated by breaks in the data. From late 1983 (the demise of Regulation Q) through early 1997, the Board of Governors conducted a monthly survey, known as the "Monthly Survey of Selected Deposits" or FR2042 survey, to collect offering rates on small-denomination time deposits from approximately 500 larger banks. Questions asked on the survey varied somewhat through time. In our judgment, the changes were not so large as to invalidate the survey's time series for our purposes. The survey was discontinued and replaced in 1997 with survey data purchased from the Bank Rate Monitor company; these data are available to us beginning in 1987. The Bank Rate Monitor survey includes a larger number of banks than the previous survey and, for the span of years when both are available, differs in level by as much as 200 basis points.

Table 1: Splice Factors in Hill and Fox Method, as applied to user costs of small time deposits at commercial banks and thrift institutions

	A_1	A_2
Commercial Banks	0.811	1.19
Thrift Institutions	0.775	1.24

We measure the overall user cost of aggregate small time deposits, at each date in each of the two data segments (corresponding to the FR2042 and Bank Rate Monitor surveys), as a Jevons-style geometric mean of the user costs. The first step in its calculation is to "yield-curve adjust" the offering rates (own rates of return) on the five maturities of small time deposits by subtracting estimated maturity-specific liquidity premiums. (Details of the yield-curve adjustment are discussed in the appendix.) Next, user costs for each maturity and date, within each data segment, are calculated by subtracting the yield-curve adjusted own rates from the estimated benchmark rate. Finally, the two user-cost segments are spliced using the normalized Hill-Fox method, that is, the final user cost series is measured as equ (4). The two Hill-Fox scale factors, A_1 and A_2, are shown in Table 1. We construct separate user cost indexes for commercial banks and thrift institutions; here, we consider only the data for commercial banks. Data for thrifts is similar.

Figures 1 and 2 compare user costs for small-denomination time deposits, constructed with the Jevons formula, equ (1), to user costs calculated with the un-normalized, (equ 3), and A_2-normalized, equ (4), Hill-Fox methods. The un-normalized Hill-Fox values, shown in figure 1, are consistently lower than, but quite close to, the values from the Jevons formula. The normalized Hill-Fox values, shown in figure 2, are consistently lower than the un-normalized Hill-Fox values. The difference between the normalized and unnormalized values, algebraically, is due to division by the factor A_2; the information content of the two indexes is the same.

Our preference for the normalized Hill-Fox index, equ (4), is based on the analysis shown in figures 3-6.

Figure 3 illustrates that because splicing index numbers via geometric means is a non-linear and non-invertible transformation, own rates of return for small time deposits cannot be recovered from spliced user costs by inverting equ (6):

(7) $$\textit{own rate} = \textit{benchmark\_rate} - \textit{user\_cost}.$$

The three lines in the figure correspond to own rates of return calculated with equ (7) from three spliced user cost series: our previous Jevons formula; unnormalized Hill-Fox, equ (3); and the A_2-normalized Hill-Fox, equ (4). For the Jevons, calculated own rates of return are negative during the first half of the 1990s and after 2000. Some users of the MSI have calculated such negative own rates and called them to our attention as an error in the MSI construction; in fact, the negative values are an artifact from use of the Jevons formula. For the un-normalized Hill-Fox, equ (3), the calculated own rates of return are negative, but less so, during 2003 and 2004. Own rates calculated with the A_2-normalized the Hill-Fox formula, equ (4), are positive, although very close to zero during 2003-2004.

The comparison shown in figure 3 has disturbed some users of the MSI, who would prefer that own rates and user costs be invariant to the method used to construct the MSI and its components. Unfortunately, this is impossible, as is illustrated in Figures 4, 5 and 6. Each figure displays three index numbers. Two of the index numbers are the same on all three figures: a Jevons sub-index built from the various maturity-specific deposit offering rates collected on the FR2042 survey, and a Jevons sub-index built from similar data collected on the Bank Rate Monitor survey. The third index number in each figure corresponds to a method of splicing the FR2042 and Bank Rate Monitor index numbers.

- In figure 4, the spliced index is the A_1-normalized Hill-Fox, equ (5). As expected, the index tracks the FR2042 index prior to 1987. Beginning in 1987, the index follows the shape but not the level of the Bank Rate Monitor index.
- In figure 5, the spliced index is Hill and Fox (1997), equ (3). As expected, the Hill-Fox index lies below the FR2042 data prior to 1987 (the date corresponding to A_1), between the FR2042 and Bank Rate Monitor data from 1987 to 1997 (the date corresponding to A_2), and above the Bank Rate Monitor data after 1997.
- In figure 6, the spliced index is the A_2-normalized Hill-Fox index, equ (4). As expected, the pattern is the opposite of figure 4, with the normalized Hill-Fox index tracking the Bank Rate Monitor index after the end of the FR2042 index in 1997.

In the published, revised MSI user costs, we follow the method of figure 6.

B. Money Market Mutual Fund Yield

Money market mutual funds (MMMF) are an important asset in the MSI. In this revision, we both correct an error in the calculation of their user cost and introduce an extension. The error was the result of an attempt gone awry to assure timely publication even when the arrival of certain data was delayed. The extension improves the indexes, beginning with data in 1997, by using separate own rates series for general-purpose/broker-dealer and for institutionally oriented money market mutual funds.

In their calculations, AJN (1997) used unpublished data regarding the yield on money market mutual funds obtained from the Federal Reserve Board. Sometimes, tardy arrival of these data threatened to delay timely publication of the MSI figures even when other data had arrived. To minimize publication delays, when necessary and for one additional period, the last-reported figure was carried forward. This compromise was based on the (implicit) assumption that any delayed observation would be in-place by the following month's production date and, at that time, the correct observation would replace the temporary extrapolated value.

In April 1997, the data source for money market funds changed. Unfortunately, due to an error, the last previously reported figure from the previous database continued to be carried forward by the computer program. A sharp-eyed user of the MSI brought this error to our attention. We have since modified our procedures and programs such that replacement of a missing figure by extrapolation of the previous value cannot continue automatically for more than one additional month. This meets, in large part, the sometimes conflicting goals of producing high-quality data in a timely fashion even when receipt of some needed input figures is delayed.

The correct and incorrect figures for MMMF yields during 1997-2003 are shown in Figure 7. The computer-generated incorrect series (shown as the dotted line in Figure 7) shows no change after mid-1997, while the actual data, of course, have changed dramatically. In early 2004, for example, broker/dealer money fund yields were approximately 1 percent, as opposed to 1997's near 5 percent yield. Assuming a benchmark yield of 5% the difference in the user cost would be almost 4% (3.8% - 0.06%).

Summary and Conclusions

Creating new index numbers by combining other index numbers is a common occurrence in applied research. In the St. Louis MSI, geometric means are used to do so in two places. First, unilateral index numbers are created for certain aggregate composite assets. Second, certain shorter index numbers that individually do not span the time period of the overall MSI are spliced to create a longer series.

Although the geometric mean formula has well-known desirable properties in index number measurement, the two uses in the St. Louis MSI differ in two respects. First, unilateral index numbers may be formed from any number of component series. Typically, all of the component indexes exist for all dates and are of similar size, often repeated measures on the same item. (Special procedures are required when this is not true, such as for the introduction of new financial assets; see Anderson et al, 1997c). Splicing, however, usually refers to creating a longer index from two shorter indexes, both of which are not defined over the same time span but overlap for a certain number of periods. Second, unilateral index numbers have no natural normalization (in the St. Louis MSI, they are normalized to their first period); spliced series also have no natural normalization but, because their components often differ in scale, an explicit normalization for relative scale is included. Because the spliced series is an index number, it may be re-normalized to an arbitrary period without loss of information. The spliced series for small time deposits discussed above is normalized to the latest period in which both component indexes are observed.

The use of index number theory to measure the amount of monetary services that consumers receive from their asset portfolio continues to be, after 25 years, an active subject of economic research. The Bank of England recently published revised series (Hancock, 2005), and the European Central Bank is preparing new monetary index numbers for the euro area. For the United States, the only currently published monetary index number data are those of the Federal Reserve Bank of St. Louis. This analysis has introduced two changes to the St. Louis figures so as to improve the measured user costs of small-denomination time deposits and money market mutual funds.

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Appendix

The Yield Curve Adjustment for User Costs of Monetary Assets

Certain aggregate assets included in the St. Louis MSI, such as small denomination time deposits, are sums of individual components that differ by maturity; see Table A-1. For these assets, maturity-specific own rates of return are available for the components, while maturity-specific quantities are not. The problem arises, then, regarding how to choose an own rate of return for the composite asset that is representative of the own rates of return on its components.

Choosing an own rate of return for a composite asset requires an economic assumption regarding its component assets' cross-price elasticities of substitution. I many studies, the components are assumed to be perfect substitutes. Under this assumption, the appropriate measure of the aggregate asset's own rate of return is the maximum of the components' own rates of return. We find this assumption implausible. Instead, the St. Louis MSI assumes that the components are imperfect substitutes for each other, and that the entire group is separable in demand from other asset groups such that the household's expenditure on the monetary services obtained from the asset group is invariant to changes in the relative own rates of return *within* the group. In this case, the appropriate measure of the aggregate asset's own rate is a Jevons-style geometric index number. Before the index can be calculated, however, maturity-related differences in the component assets' own rates of return must be removed by subtracting a *yield curve adjustment*. In the St. Louis MSI, the magnitude of the yield curve adjustment is the slope of the Treasury constant-maturity yield curve between the appropriate maturities, if positive, or zero, if the slope is negative (the curve is inverted). After subtraction, the own rate of return for the composite, aggregate asset is set equal to the highest adjusted component own rate of return. All assets' own rates of return (after the yield curve adjustment) are stated as annualized, one-month holding-period yields, on a bond interest (365-day) basis.

The yield curve adjustment may be defined algebraically as follows (Anderson et al., 1997c). Let r_n be the own rate of return for a particular monetary asset and let r_n^T be the own rate of return on a Treasury security, each having *n* months to maturity. Let r_1^T be the expected annualized one-month yield on Treasury bills, on a bond-equivalent basis. Then the yield curve-adjusted own rate is defined as $r_n^{YCA} = r_n - \max(r_n^T - r_1^T, 0)$.

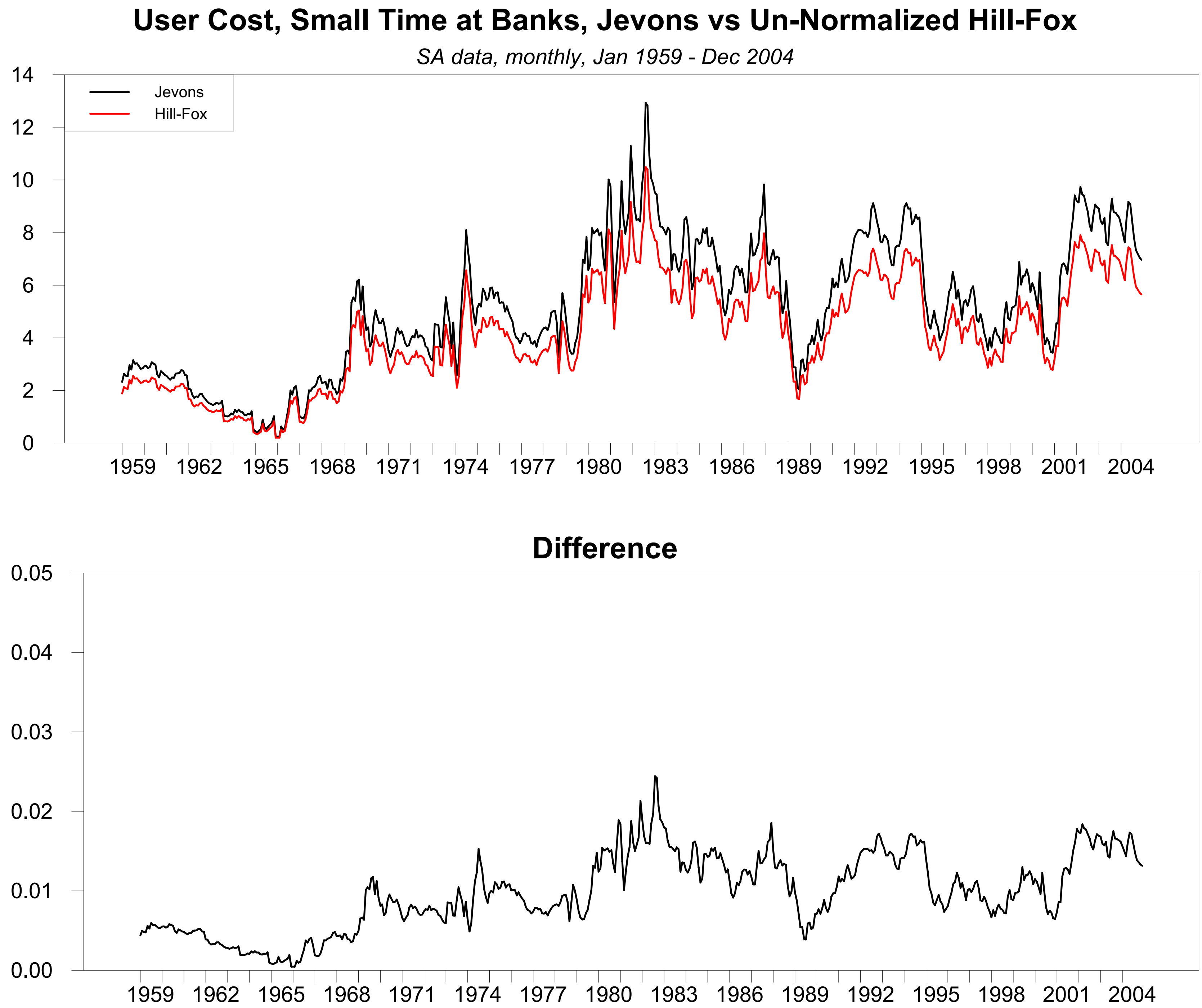
For small time deposits, the effect of the yield curve adjustment on own rates of return for 1, 2 and 3 years maturities from January 1999 to December 2004 is shown in Figure 8. For earlier discussions of yield curve adjustment in the context of monetary index numbers, see Cockerline and Murray (1981) and Farr and Johnson (1985).

Table A-1: Composite Monetary Assets in the MSI, and their components

Composite Monetary Assets in the MSI and Components	Relative Importance as of January 2005 (billions of dollars, and share of total assets in MSI aggregate)	Treasury Yields Used to Calculate Yield-Curve Adjustment
Eurodollars[1] • Overnight, 3 and 6 month maturities	$381 billion (overnight and term); 4 percent of MSI-M3	Three- and six-month secondary market Treasury bill rate
Commercial Paper[2] • 3 and 6 month maturities	(discontinued September 1998)	Three- and six-month secondary market Treasury bill rate
Bankers Acceptances[2] • 3 and 6 month maturities	(discontinued September 1998)	Three- and six-month secondary market Treasury bill rate
Large denomination time deposits[3] • 3 and 6 month maturities	$1,116 billion (negotiable and non-negotiable); 11.8 percent of MSI-M3	Three- and six-month secondary market Treasury bill rate
Small denomination time deposits[4] • 7 to 91 day, 92 to 182 day, 183 day to 1 year, 1 to 2.5 year, and 2.5 year and longer maturities	$826 billion; 12.9 percent of MS-M2; 8.7 percent of MSI-M3	Three- and six-month secondary market Treasury bill rate; One, two and three year Treasury constant-maturity yield

Notes
1. Eurodollars are included in the MSI-M3 index. This category includes overnight and term deposits. Federal Reserve data published through 1995 separated overnight from term; data published thereafter does not. A primary reason for discontinuing the separate categories was that overnight deposits often were held under continuing contracts, thereby resembling term deposits, and term deposits often were withdrawable, thereby resembling overnight deposits. The St Louis MSI use only total Eurodollars.
2. Commercial paper and bankers acceptances are included in the MSI-L index. Calculation of this index was discontinued in September 1998 when certain required data became unavailable.
3. Includes negotiable and non-negotiable CDs. Separate figures for the two categories are not available.
4. Includes “all-savers certificates,” with variable ceiling rate and 12-month maturity.

Figure 1



User Cost, Small Time at Banks, Jevons vs Un-Normalized Hill-Fox
SA data, monthly, Jan 1959 - Dec 2004
Jevons
Hill-Fox
14
12
10
8
6
4
2
0
1959
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
Difference
0.05
0.04
0.03
0.02
0.01
0.00
1959
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004

Figure 2

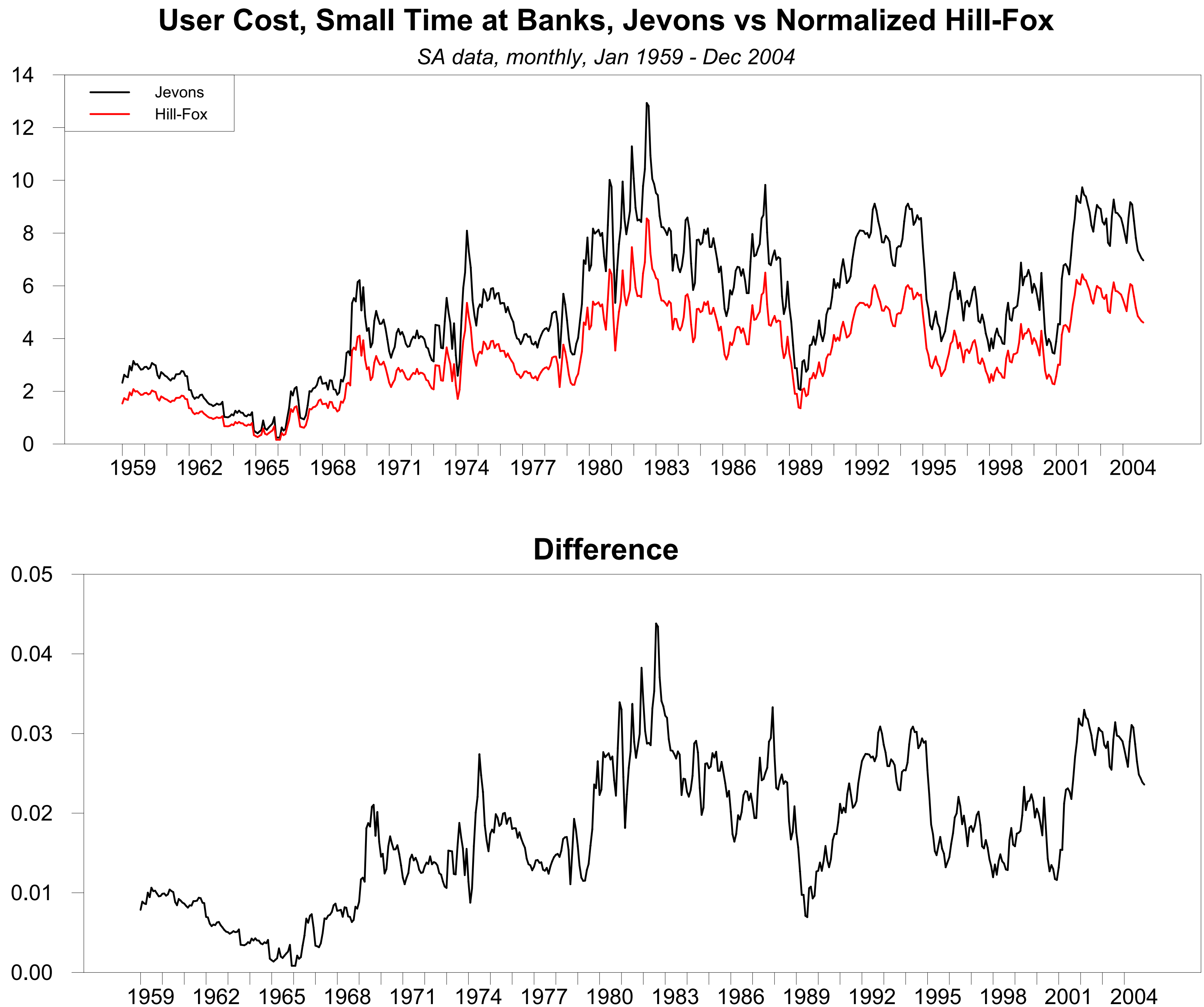

User Cost, Small Time at Banks, Jevons vs Normalized Hill-Fox
SA data, monthly, Jan 1959 - Dec 2004
Jevons
Hill-Fox
0
2
4
6
8
10
12
14
1959
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
Difference
0.00
0.01
0.02
0.03
0.04
0.05
1959
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004

Figure 3

Own Rates Implied by Spliced User Costs

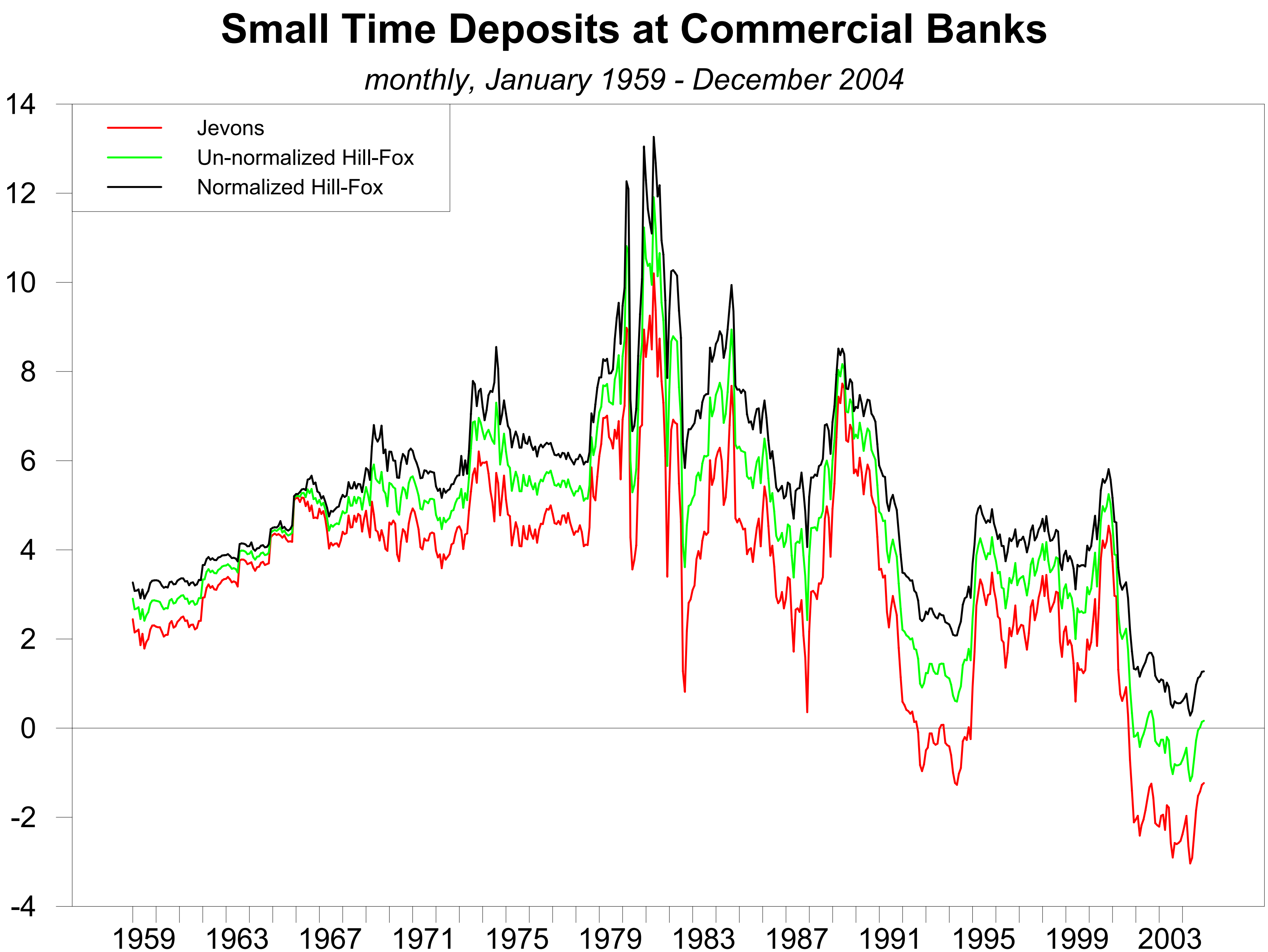


Figure 4

User Cost, Small Time at Banks, Jevons and Components

SA data, monthly, Jan 1959 - Dec 2004

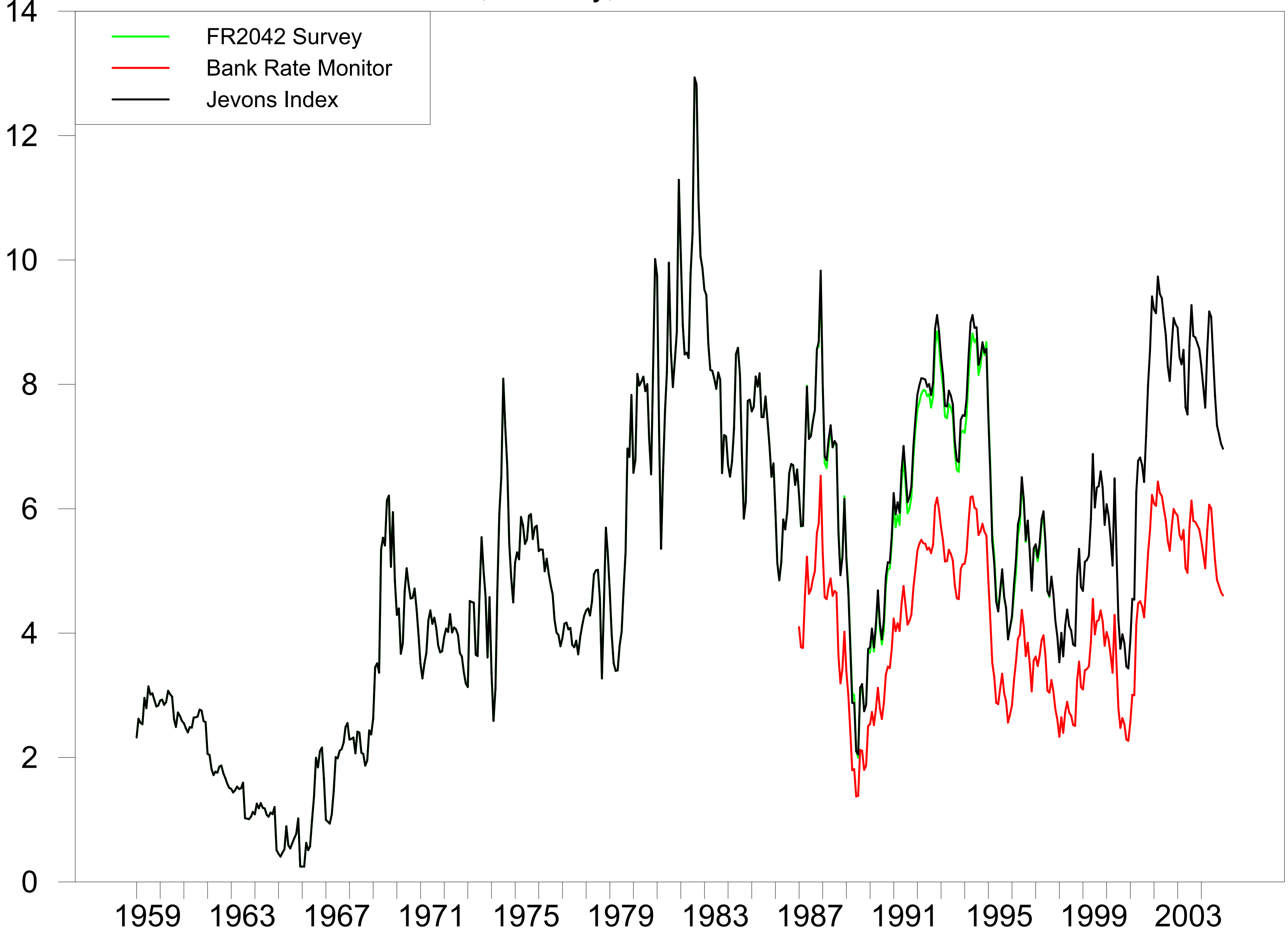


Figure 5

User Cost, Small Time at Banks, Un-Normalized Hill-Fox and Components

SA data, monthly, Jan 1959 - Dec 2004

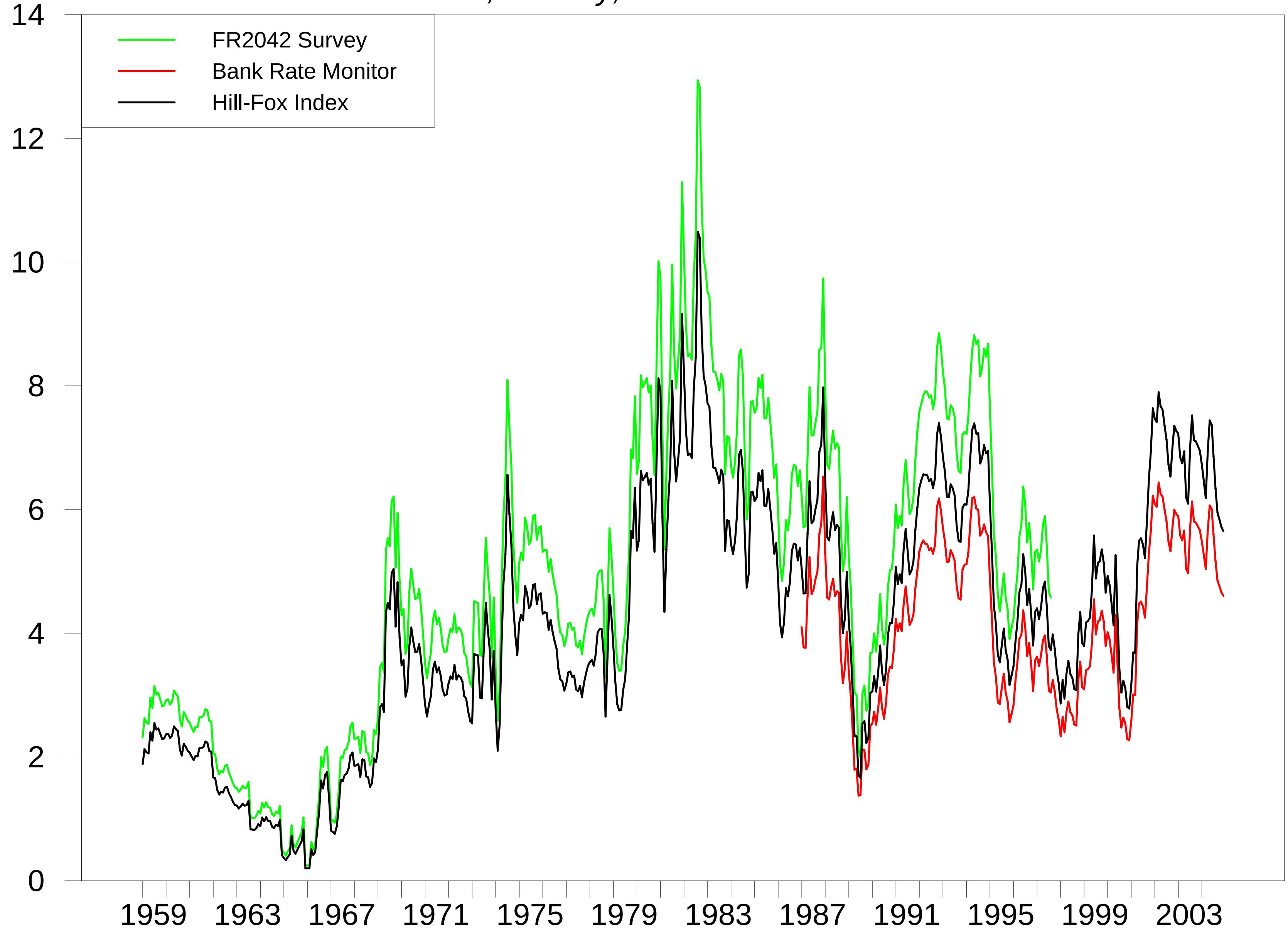
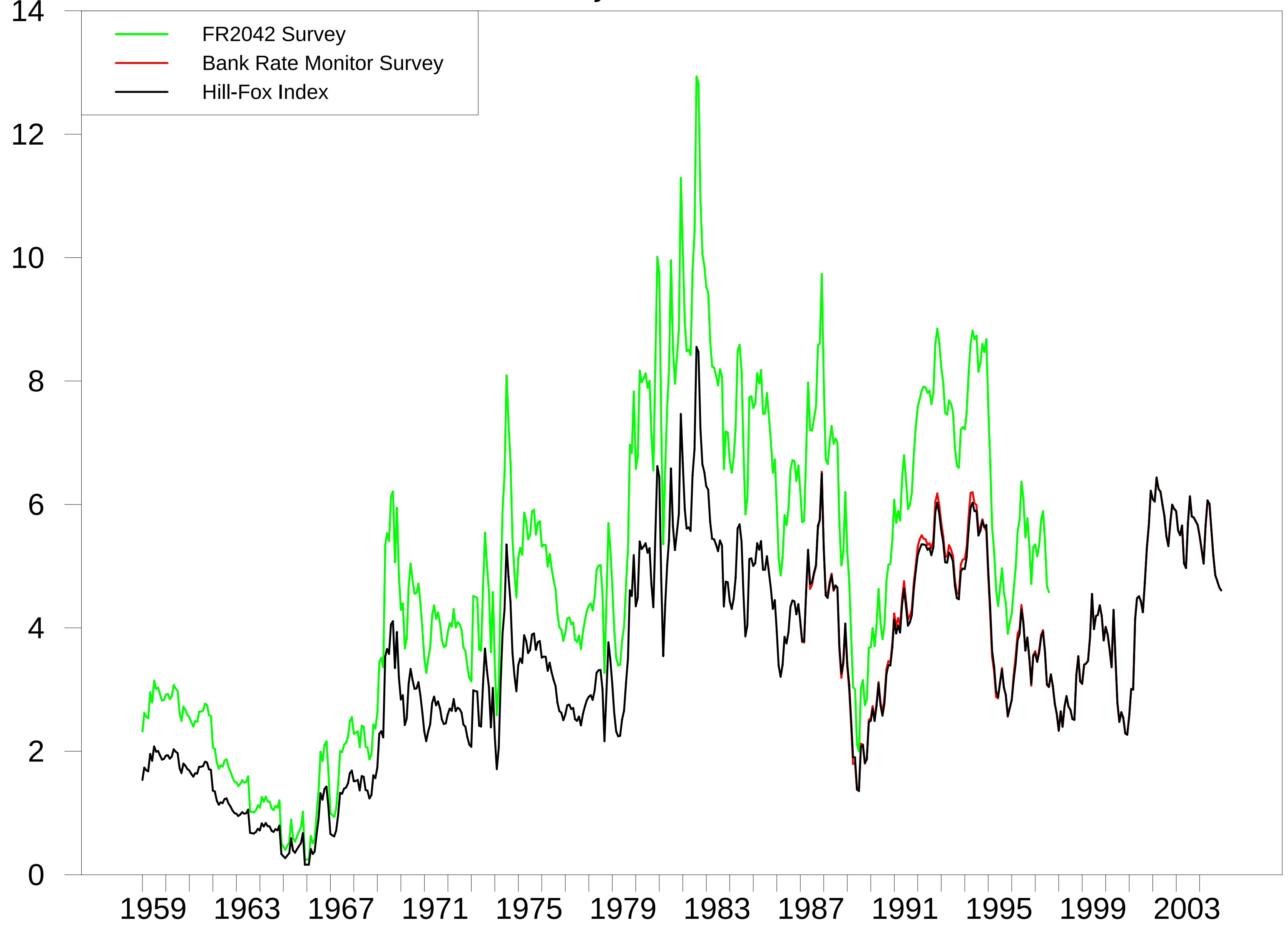


Figure 6

User Cost, Small Time at Banks, Normalized Hill-Fox and Components

SA data, monthly, Jan 1959 - Dec 2004



Money Market Mutual Funds

percent annual rate, NSA

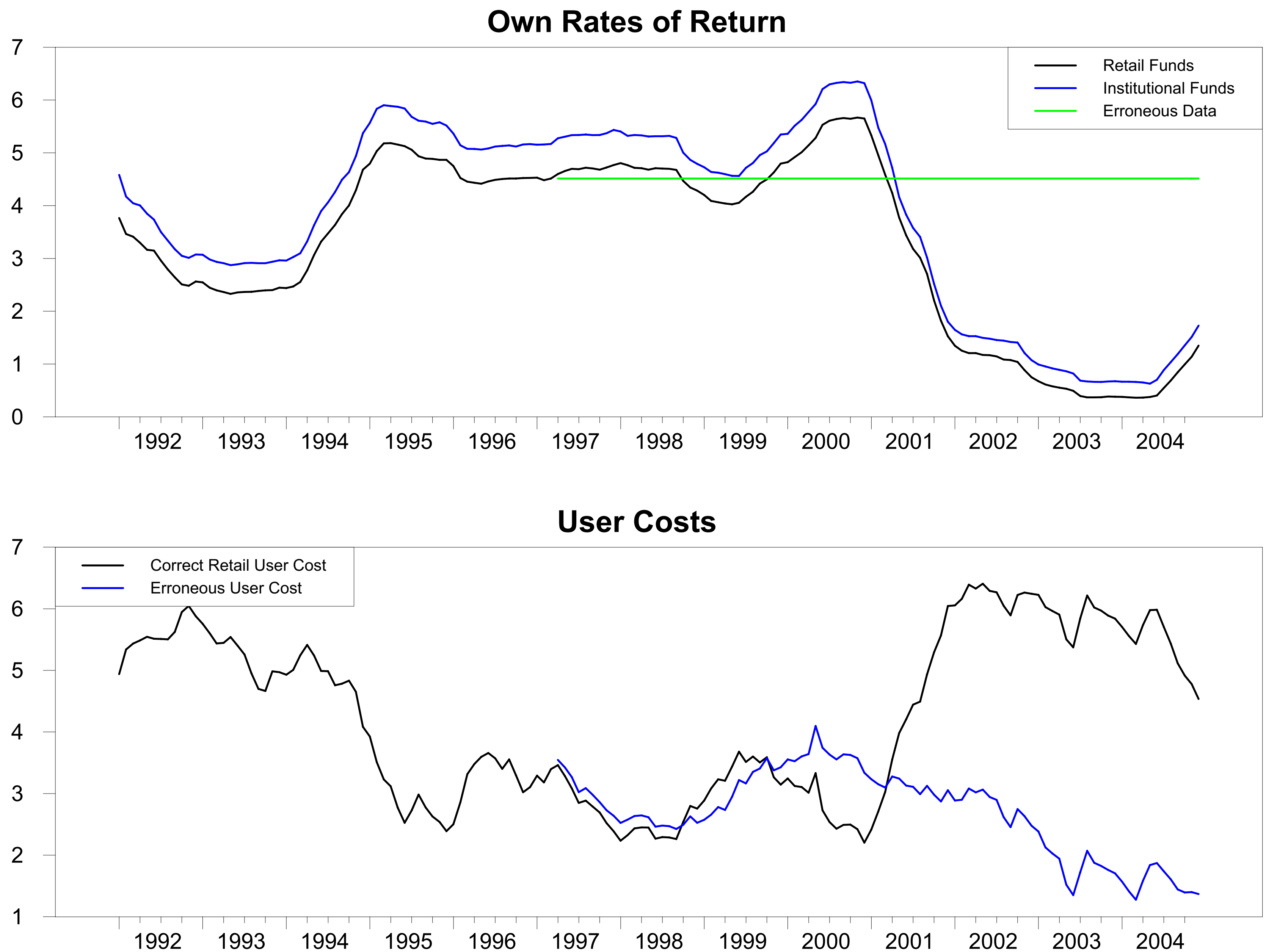
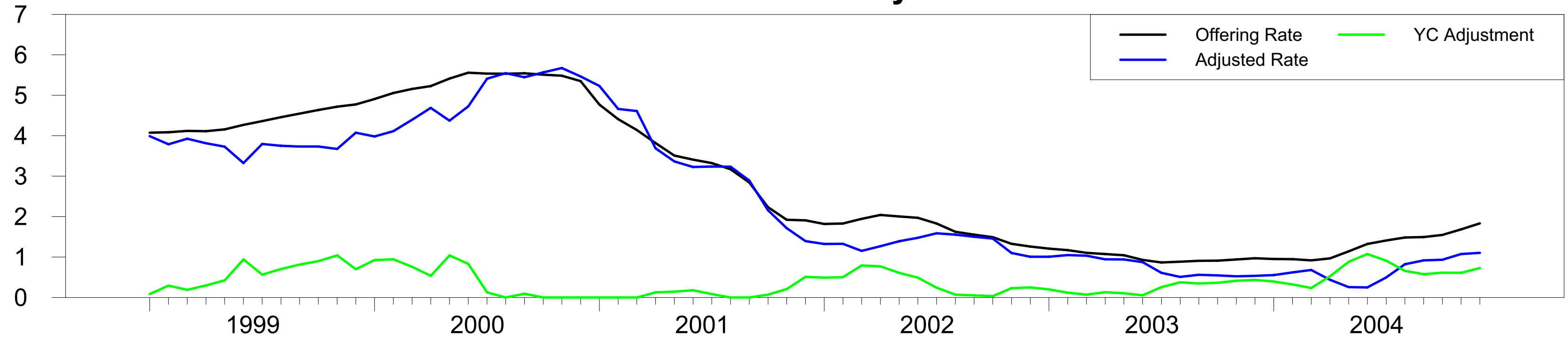


Figure 8

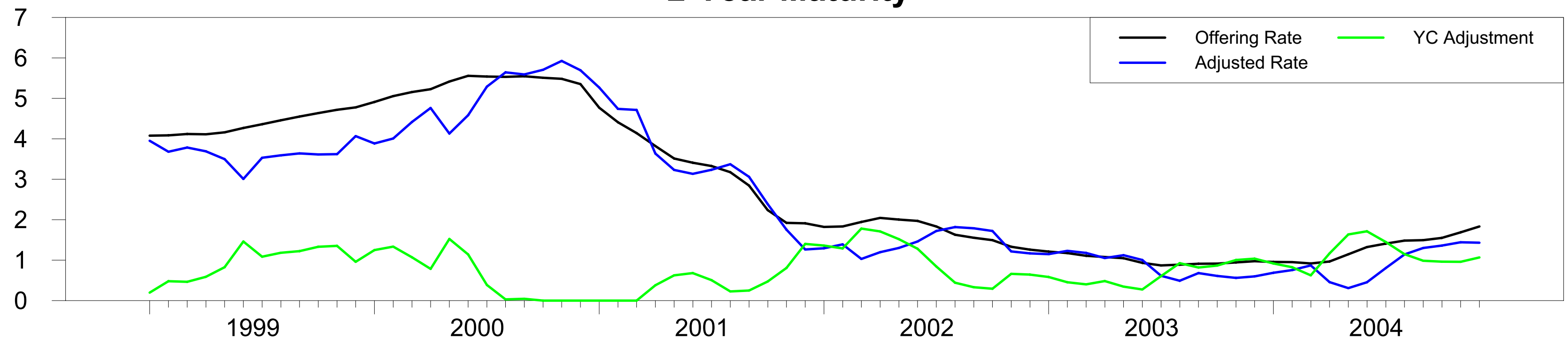
Yield Curve Adjustments for Small Time Deposits

adjusted rate = offering rate - Treasury yield spread

1-Year Maturity



2-Year Maturity



5-Year Maturity