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Mapping inflation to economic freedom in the post-COVID era

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Abstract

The *Economic Freedom of the World* report measures five dimensions of economic freedom, one of them being Sound Money. Compared to where it had been in decades for most of the West, inflation skyrocketed in 2021. Yet the indicator which measures inflation in the most recent year barely budged due to how it is specified and parameterized. This paper explores potential improvements on the methodology, although ultimately only modest improvements are achieved over simply changing the value of inflation that corresponds to zero (the lowest index score) in the simplest linear specification.

Introduction

According to the *Economic Freedom of the World* (EFW) index (Gwartney *et al.*, 2023), worldwide economic freedom fell more sharply from 2019 to 2020 than at any other point in time covered by the dataset, which runs back to 1970. While the index, without the need to make any ad hoc adjustment, measured this drastic change, it did not completely capture the decline in economic freedom (Miozzi and Powell, 2023a, 2023b). And importantly, advanced Western economies did not yet experience the inflation that was to come. While certain economic freedom variables would have been expected to soon recover following 2020, it was possible that economic freedom was to collapse still further.

But it didn't. Worldwide economic freedom simply remained where it was from 2020 to 2021 in the most recent version of the data (Gwartney *et al.*, 2023; c.f. Miozzi and Powell, 2024). In part, this was because the impact of inflation was not nearly as large as one may have thought it 'should' be. The consumer price index (CPI) inflation in the United States increased from 1.81% in 2020 to 4.70% in 2021. This resulted in the economic freedom component corresponding to inflation in the most recent year seeing its index score fall only from 9.64 index points out of 10.00 to 9.06 out of 10.00. The other measures of Sound Money in the index registered still less of an effect. The overall impact of what subjectively felt like a significant inflationary event to many Americans essentially was not reflected in the final EFW score for the United States in 2021.

While one should be very careful about overreacting to current events, the lack of any impact of inflation on the index has perhaps uncovered a problem in the methodology, as it responds minimally to inflation that does not enter double-digits. The purpose of this paper is to explore alternative ways of mapping rates of inflation to zero-to-ten index scores. As we will see in third section, how we assess this should not correspond to optimizing macroeconomic performance or balancing inflation and unemployment in terms of subjective well-being, but the manner in which inflation impacts economic

freedom. Especially, we will argue that Sound Money is best defined as the provision of a key public good (a functional monetary system), and that inflation that does not harm property rights. We will not be considering further changes to the Sound Money area of EFW, such as whether the provision of money has been unmoored from central banks.[1]

The exercises in this paper are not to critically assess the difference in how inflation can be harmful from the standpoint of welfare, but our ability to find functional form that map inflation values to index scores in any reasonable way. One challenge that will be confronted is assigning an index score of around 5% a tangibly worse score than what is assigned for an inflation rate of around 2%, while both maintaining high index scores for 2% and not yielding other results that are clearly incorrect. We eventually are able to identify a somewhat elaborate (but inelegant) functional form that gives sensible results for any level of inflation. However, the results from this formula only modestly differ from merely changing the parameter values in the original linear scoring methodology. An adjustment to the methodology in EFW seems warranted, but there is a tradeoff between an excessively complex functional reform and marginal improvements in how inflation values are mapped to index numbers. All data and figures are produced in online supplementary materials.[2]

Preliminaries and current methodology

The purpose of the EFW index is to measure the extent of liberal market institutions by country over time. The index covers five areas, the [limited] Size of Government, the Quality of the Legal System and Property rights, Sound Money, the Freedom to Trade Internationally and [limited] Regulation. Economic freedom is one dimension of institutional quality in general; along with others such as democracy or the quality of government, it plays a potentially decisive role in explaining 'how the world became rich' (Koyama and Rubin, 2022). Economic freedom has a robust relationship with a wide array of positive social outcomes (Lawson, 2022), most notably with various measures of economic performance, although the standard caveats concerning identification in the context of the comparison of countries. Sound Money is one part of economic freedom as defined by the likes of Hayek (1960), Friedman (1962) or Boaz (2015), and it occasionally appears to be an important driver of the positive effects of economic freedom overall (Gehring, 2013; Graafland, 2023; Nikolaev and Bennett, 2016).

The data on Sound Money play a key role in establishing the extent to which liberalization took place in the world from the 1970s to the 1990s, as countries throughout the world got ahold of their rates of inflation. Throughout both the Great Moderation and the years following the Great Recession, inflation remained low and index scores remained high for Sound Money for most of the world. The area of 'Sound Money' is comprised of four variables: money growth relative to GDP growth, the standard deviation of inflation, the rate of inflation in the most recent year and freedom to own foreign currency bank accounts. The first of these two variables assesses Sound Money over five years, while the third, which is the focus of this analysis, captures the soundness of money in one particular year. The freedom to own foreign currency bank accounts is a combination of two binary questions: whether it is legal for a citizen in the country to open a bank account in their country but denominated in a foreign currency, and whether it is legal for them to own a bank account in a foreign country, as answered in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*. The rate of inflation in the most recent year is measured using the CPI, and if it is not available, the GDP Deflator is used.

The current method of scoring the rate of inflation in the most recent year is to take an inflation rate of zero and set it to '10' and an inflation rate of 50% and set it to '0'. Values in-between are linearly

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[1]Under most ways of scoring countries by whether they rely, explicitly (domestically) or implicitly (foreign, as in dollarization), on a central bank, the variable would essentially be a zero for the entire panel of data. This would have no consequences on the time series variation in Sound Money. However, if there are five variables now scoring Sound Money, and four of them are always zero, then Sound Money is being scored on a zero to eight scale, and Sound Money will receive less implicit weight than the other areas of EFW because it controls less of the variation.

[2]These are available at: http://www.ryanhmurphy.com/uploads/1/3/2/7/13275808/murphy_-_inflation_-_figures.xlsx

interpolated. While it may be completely reasonable to argue that inflation should be higher than 0%, it makes next to no material impact on the index if a central bank is targeting 2% inflation when using this methodology. That causes the subcomponent to downgrade from a 10.00 to a 9.6. Since the variable is one-quarter of the index, that in turn would cause the Sound Money area of EFW to decline by 0.1 points on a 10.00 point scale. Because Sound Money is one-fifth of EFW, 2% inflation rather than 0% inflation causes the final index score to be 0.02 points lower on the 10.00 point scale, which roughly corresponds to 2% of a standard deviation.

An additional wrinkle is that, should deflation occur, the scoring system is 'symmetric', meaning that a negative rate of inflation will yield the same score as a positive rate. The money growth variable behaves similarly, such that if money growth occurs more slowly than GDP growth, the score is also reduced symmetrically. These circumstances actually arise with some frequency, even among developed economies.

Finally, we should note that the first two historical editions of EFW did not contain inflation in the most recent year as a variable. It appears first, rather, in the '1998/1999 Interim Report' (Gwartney and Lawson, 1998). In this report, the same method as what is currently being used was applied, with '10' and '0' corresponding to 0 and 50%, respectively. But that point in time was not too far removed from when inflation was meaningfully widespread in a way that it hadn't before or since. A country with a rate of 8% inflation might then be accurately assessed as doing a reasonable job at keeping its inflation down. The score corresponding to that 8% is 8.40/10.00. There was a sufficient number of countries that had rates of inflation in the [0%, 50%] interval that the linear interpolation plausibly captured the distribution of the data.

The meaning of Sound Money

The concept of economic freedom and how to measure it were widely debated in a series of conferences taking place in the 1980s, one of whose proceedings was recorded and summarized in Block (1991). In the initial publication of EFW, Gwartney *et al.* (1996: 12) highlight comments by Rabushka (1991) which describe property rights as of central importance for economic freedom. This emphasis is in the background of subsequent publications concerning EFW, and Sound Money must be understood in relation to it.

> Private property is the common denominator that underpins every liberal philosophical treatment of individual economic freedom. John Locke regarded the existence of private property as the proper condition of man in a state of nature; the primary function of civil society, to which man granted the rights he enjoyed in the state of nature, was the protect and preserve private property (Rabushka, 1991: 88–89).

For the purposes of understanding the relationship between Sound Money and economic freedom, we must therefore clarify its own meaning in this context, and what we are to mean by property rights, given its importance above.

Essentially, we employ the classical liberal definition of property rights, running from Locke to Nozick (1974) to Brennan (2014). In terms of specifics for the definition, it does not seem desirable to differ from the standard 'bundle-of-sticks' metaphor (Baron, 2014), where property rights are summarized as a combination of the right to control, the right to dispossess, the right of enjoyment and the right to possess. And the 'bundle-of-sticks' metaphor is itself not too distant from what was described in a chapter in the *Handbook of Development Economics*:

> The term *property rights* refers to an owner's right to use a good or asset for consumption and/or income generation (referred to as 'use rights'). It can also include the right to transfer to another party, in the form of a sale, gift, or bequest (referred to as 'transfer rights'). A property right also typically conveys the right to contract with other parties by renting, pledging, or mortgaging a

good or asset, or by allowing other parties to use it, for example, in an employment relationship (Besley and Ghatak, 2010: 4526; emphasis in original).

Rabushka (1991: 88–91), Gwartney et al. (1996: 12–14, 21–23), Gwartney and Lawson (2003: 413–414) and Gwartney et al. (2023: 3) do not directly define property rights in the relevant section, instead emphasizing their importance and their relationship to legal system quality and the rule of law. Something akin to either the purely Lockean definition, the 'bundle-of-sticks' definition, or the definition given by Besley and Ghatak (2010) appears to be assumed. But in the context of measurement and cross-country comparisons, what is more important than to settle on one of those three (or something else altogether) is to state what it means to have *stronger property rights*, and therefore, a higher or lower index score.

What we will define as having 'stronger property rights' is the *extent* of property rights (relative to the public sector), the *security* of property rights (against the intrusion of both private actors and governmental expropriation, as well as the prevention or regulation of the use of a property right as its owner deems fit) and the *universality* of property rights (security for all, not just for the elite). These three criteria, for the purposes of EFW, meet Hodgson's (2019: 213) standard to be considered a taxonomic definition.[3] They are somewhat distant from Hodgson's (2019: 223) definition of a market ('an institution through which multiple buyers or multiple sellers recurrently exchange rights to a substantial number of similar goods or services of a particular type'), although the extent, the security and universality are likely supportive of the effective functioning of markets as so defined.

Where definitions of property rights practically run into difficulty in this space is whether intellectual property 'counts' as a property right. This question as posed among classical liberals is elaborated upon at length in Mossoff (2022). Earlier editions of EFW included intellectual property rights protection as one of its measures, but has since ceased. Rather than taking a philosophical stand on the question, it is simply recognized that the relevant theorists in question do not themselves agree. But aside from the protection of intellectual property, where there is disagreement concerning the extent, security and universality of private property, there are only edge cases.

We can now keep in mind the above discussion of property rights in mind while defining Sound Money, such that we can improve its measurement. Gwartney et al. (1996) begin their definition of the original Sound Money area (labelled 'Money and Inflation' at this point in time) by stating,

> Since money plays such a central role in the exchange process, monetary institutions and arrangements exert an important impact on the security of property and freedom of exchange. Money makes it possible for people to engage in complex exchanges involving the receipt or income or payment of a purchase price across lengthy time periods. It also provides a means of storing purchasing power into the future (Gwartney et al., 1996: 17).

The above description of the purpose of the area from the classical liberal perspective can be read in concert with the statement concerning property rights from Rabushka above as well as today's summary description of economic freedom:

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[3]Hodgson lists that definitions in social science are 'nominal' (in contrast to an essentialistic or 'true' definition of the term), not 'intensional' (one has the ability to provide an exhaustive list of properties characterizing it), possibly but probably not 'extensional' (one can list all instances of it), are often 'lexical' (one can look up its meaning in a specific source), and require little 'stipulation' (the definer does not need to ask the reader to take the definition as given). Although the theory of property rights, including a figure like Locke, may treat the philosophical definition as the 'true' definition, that is unnecessary here; the definition is nominal. While a figure like Rothbard (1998) may protest that all questions concerning property rights can be worked out (meaning it would be intensional), there are undoubtedly edge cases concerning what constitutes the universality of a property right (e.g. ownership of property by children). All instances of property rights cannot be articulated, so it is not extensional. The extent, security, and universality of property rights can be readily understood in terms of authoritative sources that do not require much stipulation.

> The cornerstones of economic freedom are personal choice, voluntary exchange, freedom to enter markets and compete, and security of the person and privately-owned property (Gwartney *et al.*, 2023: v).

And later,

> [EFW] might also be thought of as an effort to identify how closely the institutions and policies of a country correspond with the classical liberal ideal of a limited government, where the government protects property rights and arranges for the provision of a limited set of 'public goods' such as national defense and access to money of sound value, but little beyond these core functions (2023: 2).

Taking these arguments together, the purpose of the Sound Money indicator is twofold. First, it is to be read in terms of property right and how well monetary policies and regulations adhere to property rights. Here, that most concerns the ability of inflation (or deflation) to expropriate wealth – i.e. the security of property rights. Secondly, Sound Money is to be evaluated in terms of the role it plays as a public good. However, although some early language by Rabushka (1991: 100–103) indicates to the contrary, this is *not* meant to be interpreted as macroeconomic stability; rather, in today's language, it is better thought of as Sound Money playing its role as a market-supporting institution in the sense of Besley and Persson (2009). It acts as a market-supporting institution in ways including, but not limited to, the reduction of transaction costs in the marketplace (Ostroy and Starr, 1990; Saving, 1971; c.f. Menger, 2009).

These dual meanings of Sound Money compete with other ways of defining it. Among some classical liberal economists, either free banking systems or the gold standard remains a lodestar (as acknowledged by Rabushka [1991: 100]). One would think that Sound Money supporting free markets should be the same as the answer to 'How would the invisible hand handle money?' (Selgin and White, 1994), after all. But even granting that either free banking or a return to the gold standard is both feasible and desirable, countries do not meaningfully differ from one another on these margins. There is no country with a free banking system, for example.

And if one were to actually implement 'macroeconomic stability' as a criterion for Sound Money, it would then raise thorny issues concerning what target should be adopted; many classical liberal economists may argue normatively for deflationary monetary policies (Horwitz, 2003; Hulsmann, 2008; Selgin, 1997), at least at times, which is in contrast to nearly the entirety of the profession. Macroeconomic stability also remains distinct from how to best weigh inflation versus unemployment (Di Tella *et al.*, 2001), or the determination of when the level of inflation becomes harmful to long-run growth.[4]

The project of advancing the definition of Sound Money in EFW has been essentially dormant, and there has been no direct impetus for changing its measurement or theoretical definition for decades. However, we can also consider Koyama and Johnson (2015), who note four ways in which monetary instability can impede the rule of law, and this can form another basis for defining Sound Money in terms of property rights and as a market-supporting institution.[5] They list:

(1) 'Sustained monetary instability corrodes the ability of the price system to allocate resources.'
(2) 'A period of sustained high inflation expropriates savers and benefits borrowers and can entail a radical redistribution of resources. Conversely, a period of rapid and unexpected deflation expropriates borrowers and benefits savers.'

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[4]See Sarel (1996), Bruno and Easterly (1998), Khan and Senhadji (2001) and Barro (2013) for exercises connecting inflation rates with growth rates.

[5]Others have discussed placing money in rule-bound system and have phrased that as a dimension of the rule of law (Boettke *et al.*, 2021; Jordan and Luther, 2022; c.f. Yeager, 1962). There is also related literature on the relationship between inflation and corruption (Goel and Nelson, 2005; Paldam, 2002) and inflation and democracy (Gasiorowski, 1995). The most apt work for our purposes, however, remains Koyama and Johnson (2015).

(3) 'Sustained periods of monetary instability reduce the relative payoff to participating in market exchange and increase the incentive to engage in non-market activities.'

(4) 'Monetary instability undermines the rule of law because it appears to make necessary all kinds of discretionary policies such as wage and price controls, the implementation of which is incompatible with a liberal interpretation of the rule of law' (Koyama and Johnson, 2015: 47–48).

The first and third of these are concerned with the functionality of money as a market-supporting institution. The second is Sound Money purely as property rights. The fourth does not follow the logic of how we have defined Sound Money,[6] but empirically it may be reflected in indicators in the Quality of the Legal System and Property Rights area of EFW. Koyama and Johnson (2015) effectively restate much of the intuition behind the Sound Money area of EFW, although they do not directly say as much.

Ratings for Sound Money reflect two concerns: the ability of money to function as a market-supporting institution, and that its loss (or gain) in value does not erode property rights. Inflation rates in the latter part of the Great Moderation only minimally impacted the US dollar on either of those dimension (again, setting aside concerns regarding macroeconomic stability).[7] The effect of the higher rate of inflation in 2021 did not put up significant implicit barriers to the functioning of commerce or act as a massive expropriation of wealth, but it was certainly tangible in a way that inflation had not been for many years. A measure which captures the definition of Sound Money should too reflect that inflation in the United States in 2021 modestly, but tangibly, impacted the ability of Sound Money to support markets and hold value, not that it had virtually no effect.

Alternative methodologies

An issue with the focus on property rights instead of macroeconomic performance is that we do not have any objective, third-party benchmark to use. Our only real means of assessing whether the method for translating data to index values is 'face validity', i.e. whether a measure appears to be measuring what is meant to measure. Practically speaking, face validity is often what determines what ends up being used as a metric; Bill James has been quoted as saying, '[i]f you have a metric that never matches up with the eye test, it's probably wrong. And if it never surprises you, it's probably useless. But if four out of five times, it tells you what you know, and one out of five it surprises you, you might have something' (Kang, 2017). By this standard, the United States and other countries have made it clear that scores for countries that were roughly in the range from 5 to 10% inflation (and receiving scores between 8.0 and 9.0) were not passing the 'eye test' and face validity with high marks.[8]

Prior to proceeding, I will make note of seven benchmark rates of inflation to compare each methodology consistently. The ones I will use are 1%, 2%, 4.70% (the rate of inflation in the United States in 2021), 8% (both a threshold Sarel [1996] has argued the effects of inflation become much worse and the rate of inflation in the United States in 2022), 13.55% (US inflation in 1980, the peak yearly inflation during the Great Inflation), 25% and 50%. The linear methodology currently used in EFW would assign these rates of inflation scores of 9.80, 9.60, 9.06, 8.40, 7.29, 5.00 and 0.00, respectively. We will refer to what is currently used in EFW as *Linear50*. Table 1 below provides index scores corresponding to each critical value for all methods we will explore.

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[6]The dynamic described in this fourth mechanism is an instance of the dynamics of interventionism (Mises, 1998).

[7]Horwitz (2003), among others, has criticized the disruptiveness of even the low inflationary environment of the Great Moderation for the function of the price system, but the more recent departures from price stability are a far greater departure from the ideal.

[8]There are means of guaranteeing face validity. One could 'brute force' scores into face validity by arbitrarily choosing intervals and assigning them scores, but that would impede the index by artificially introducing unnecessary discontinuities for a continuous variable.

The first option we will consider is to simply change the maximum value of inflation, i.e. the lowest value that scores a 0.00, from 50 to 25. The amount this method 'punishes' a country is merely doubled, in comparison to *Linear50*, i.e. 1% is scored 9.60, 2% is 9.20, 4.70% is 8.12, 8% is 6.80, 13.55% is 4.58 and both 25% and 50% are 0.00. The score for 4.70% is more reasonable, as are the scores for 8% and 13.55%. But it also exacerbates what could be considered a weakness of the original method: not only does it score 50% and 5,000% rates of inflation as the same, it scores 25% as the same as well. It is also quicker to punish low rates of inflation. We will call this methodology *Linear25*. The puzzle to solve in remainder of this section is to improve on *Linear25*.

Linear25 preserves the theoretical characteristics of the current scoring system. The linear nature of the variable corresponds to the interpretation of the inflation variable as being about property rights, though not its interpretation as a market-supporting institution that facilitates monetary calculation. *Linear25* and the alternatives that follow should also be interpreted as symmetric scores, i.e. the absolute value or the variable should be taken for negative inflation scores. But these alternatives ditch the linear functional form, and further improvements on *Linear25* in terms of face validity must be balanced with that cost in mind.

The first alternative of another different functional form is taking the log of the rate of inflation, even though this immediately raises the problem of what to do with inflation values between zero and one, which logging maps to negative numbers. This is partly fixed by adding one unit to the rate of inflation before logging it. However, the integer that we could add is arbitrary, aside from the elegance of matching a zero to the zero rate of inflation. A score for inflation using logs would take the general form of,

$$Score_{i,t} = V_{max} - \alpha \log_\beta (\pi_{i,t} + \gamma) \tag{1}$$

where i and t represent country and year, V_{max} is the maximal index value (for EFW, 10), π is inflation, and α, β and γ are parameters. We set α equal to 3, β equal to 4 and γ equal to 1 since, as far as we can tell, these parameter values come closest to maximizing face validity for this functional form.

Figure 1 compares *Linear50* and *Linear25* to the logarithm methodology. This method assigns a score of 8.50 to 1%, 7.62 to 2%, 6.21 to 4.70%, 5.25 to 8%, 4.21 to 13.55%, 2.95 to 25% and 1.49 to 50%. This does not appear that much of an improvement from the standpoint of face validity. Scorings for 4.77, 8, 13.55 and 25% are improvements, but the method far too rapidly punishes low rates of inflation, much worse than *Linear25*. The method places too much emphasis on 'getting
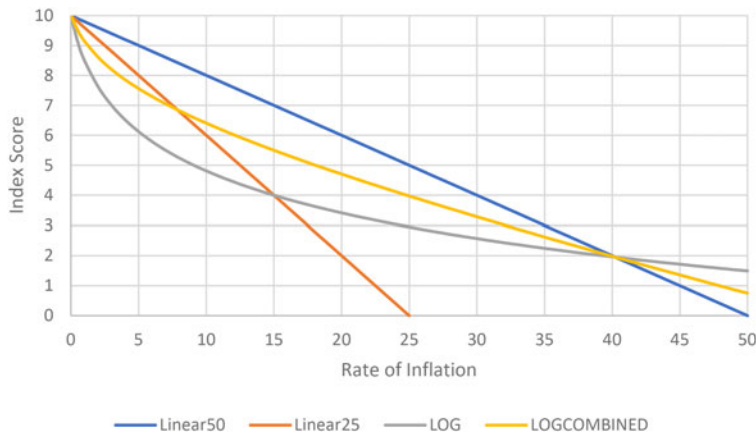

Figure 1. Scorings for Linear50, Linear25, LOG and LOGCOMBINED.

Table 1. Critical values of different methods of scoring inflation, compared

Method	1%	2%	4.70%	8%	13.55%	25%	50%
Linear50	9.80	9.60	9.06	8.40	7.29	5.00	0.00
Linear25	9.60	9.20	8.12	6.80	4.58	0.00	0.00
LOG	8.50	7.62	6.21	5.25	4.21	2.95	1.49
LOGCOMBINED	9.15	8.61	7.65	6.82	5.75	3.97	0.75
LOGSPLICED	9.80	9.60	7.92	6.89	5.71	3.86	0.59
LOGISTIC	9.74	9.45	8.43	6.80	3.74	0.54	0.00

to zero' rather than getting inflation down to a level that secures property rights and supports markets. We will refer to this method as *LOG*.

Figure 1 also includes *Linear50* and *LOG* averaged together, with scores of 9.15 assigned to 1%, 8.61 to 2%, 7.65 to 4.70%, 6.82 to 8%, 5.75 to 13.55%, 3.97 to 25% and 0.75 to 50%. These scores are an improvement in some sense, but averaging yielded mediocrity: the method is still too harsh on the very low rates of inflation, but it no longer scores countries with higher rates of inflation quite as sensibly. I should note that adjusting parameter values in any way yields a similar tradeoff between the different benchmark numbers. Let us call this method *LOGCOMBINED*.

Our next approach yields something closer to face validity, but it achieves the result inelegantly. Over the interval [0,2], score the rate inflation as EFW has in the past. For values greater than two, splice the logarithm methodology to 9.60 at 2.0% and use the logged values thereafter. We are choosing to sync at 2.0% because of its salience, but the sync point is arbitrary and could be adjusted by adjusting parameter values in equation (2) below.

$$
\begin{cases}
IF\ Inflation < 2.0\%, & Score_{i,t} = 10 \times (50 - \pi_{i,t})/50 \\
IF\ Inflation > 2.0\%, & Score_{i,t} = V_{max} - \alpha\log_\beta(\pi_{i,t} + \gamma) - 0.2 \times \gamma
\end{cases}
\tag{2}
$$

Parameter values are the same as before, except γ is now set equal to 2 (and γ appears in the final term to make the sync). Doing this alone still fails face validity, however.

But if we take the method described in equation (2) and average *that* with *Linear50*, we finally get something that begins to approach face validity. This method assigns a score of 9.80 to 1% inflation, a 9.60 to 2% inflation, 7.97 to 4.70%, 6.89 to 8%, 5.71 to 13.55%, 3.86 to 25% inflation and 0.59 to 50% inflation. But its *ad hoc* nature and increasing degree of complication are clear detriments to the approach. Let us call this method *LOGSPLICED*. To reiterate, *LOGSPLICED* is the average of what appears in equation (2) and *Linear50*.

There also remains a more fundamental problem with the functional form. Logging implies each additional point of inflation is always considered worse, but the second derivative is negative. What we really want, from the standpoint of face validity, is for 'badness' to first be increasing at a slow rate, and then to increase quickly over the interval of, roughly, [2.0%, 25%], and then return to increasing at a slow rate.[9] That is to say, that at very low rates of inflation, it isn't really detrimental at all, and at very high rates, the marginal percentage point of inflation (e.g. going from 52% to 53%) also really doesn't matter that much. The functional form just described is a logistic function. Equation (3) below

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[9]This statement is meant in terms of the ability of money to support markets and allow for monetary calculation, not with respect to the business cycle consequences of these different levels of inflation.
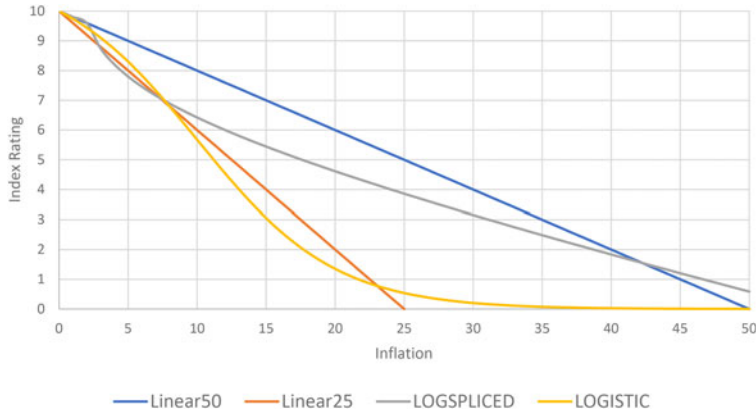
Figure 2. Comparison of LOGSPLICED and LOGISTIC with linear methods.

provides a Sigmoid function adopted for this purpose:

$$Score_{i,t} = V_{max} - 10 \times \left(\frac{1}{1 + e^{-(\pi_{i,t} - \theta)/\delta}} - \mu \right) \times \frac{1}{1 - \mu} \tag{3}$$

θ and δ are parameters that we can adjust so the variable captures the distribution as we desire. (The parameter μ is the value of the whole $1/1 + e^{-(\pi_{i,t} - \theta)/\delta}$ term when it is at zero, so subtracting it and adjusting it with the final term forces the whole term to a [0,10] scale.) The parameter values that were selected were 10 for θ and 5 for δ.

When this method is implemented, it assigns a score of 9.74 to 1% inflation, 9.45 to 2% inflation, 8.43 to 4.70% inflation, 6.80 to 8% inflation, 3.74 to 13.55% inflation, 0.54 to 25% inflation and 0.00 to 50% inflation. Its face validity is approximately the same as *LOGSPLICED* and perhaps a modest improvement over *Linear25*. Undesirably, it has a smaller gap between 2% inflation and 4.70% inflation than *LOGSPLICED*, but *LOGSLICED* was engineered to achieve the larger gap. The other scores using this method have equal or greater face validity than *LOGSPLICED*. Let us call this method of scoring *LOGISTIC*. Figure 2 compares the original linear method, *LOGSPLICED*, and *LOGISTIC*.

Figure 3 compares the same four methodologies as applied to the United States over time. *Linear25*, *LOGSPLICED* and *LOGISTIC* are each very similar to another while differing considerably from *Linear50*; the similarity is in part the result of the inflation in the United States having never breeched
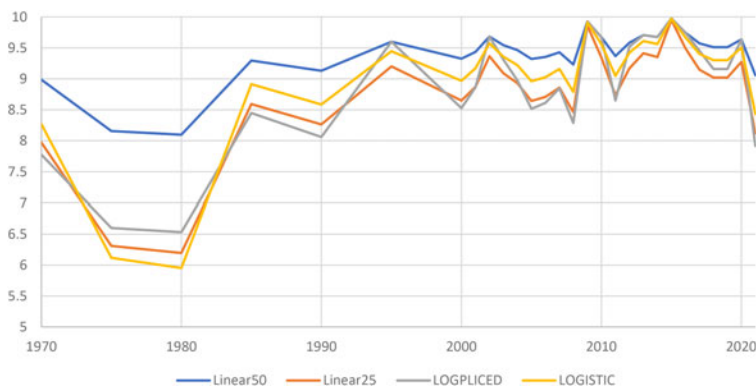

Figure 3. Comparison of four methodologies as applied to the time series for the United States.
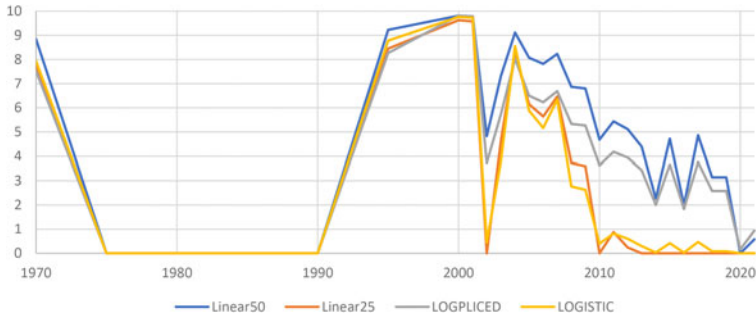
Figure 4. Comparison of four methodologies as applied to the time series for Argentina.

10% in the years that are measured (recall: the data are quinquennial prior to 2000). Note that the *y*-axis is cut off at a score of 5.0. *Linear50* never meaningfully falls in the United States except during the Great Inflation, where it falls to around 8.0/10.00. The other three methods pick up more variation during the Great Moderation and the years that follow, while scoring the United States as around 6.0/10.00 during the Great Inflation.

Figure 4 provides a radically different picture, presenting the time series for Argentina scored by the four different methodologies. Alongside it is Figure 5, which reports absolute inflation in Argentina on a log scale for reference. All four methods give Argentina a zero for its extremely high levels of inflation from 1975 to 1990, and also rather similar scores as it got its inflation control. It's where Argentina once again loses control of its inflation that there are big differences. While inflation throughout the last decade has sat in low double digits, generally around 30%, *Linear50* and *LOGSPLICED* both have assigned Argentina scores well above zero, whereas *Linear25* and *LOGISTIC* have sat at or around zero, with *LOGISTIC* providing a somewhat more nuanced picture than *Linear25*.

In both of these cases, the other methodologies appear better than *Linear50* in their scorings across each time series, at either extreme (generally low levels of inflation versus generally very high levels of inflation). That is to say, although this exercise was motivated by issues in economic freedom in the most recent year, the other methodologies improve face validity outside of just 2021.

One other means of assessment besides face validity is the extent to which the system of scoring is making use of the empirical distribution of the data. On the one hand, we do not want this to excessively influence what we consider to be 'good', but on the other, it's less than desirable for a large percentage of
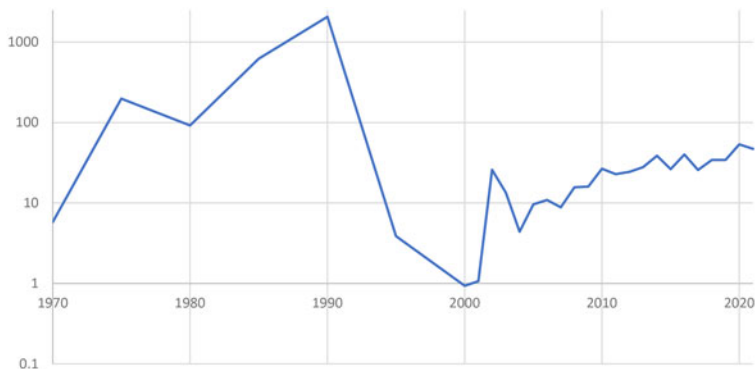

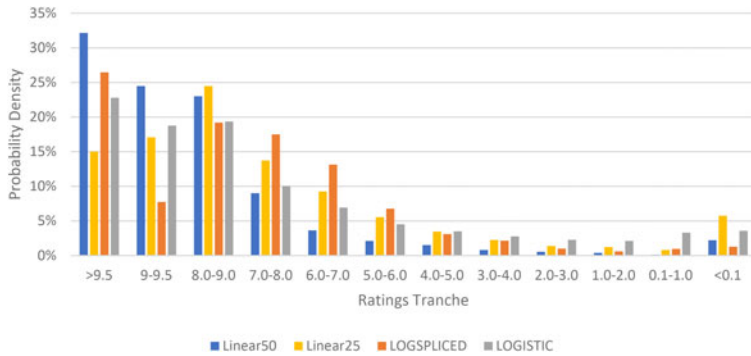**Figure 5.** Absolute inflation in Argentina, log scale.

Figure 6. Comparison of four methodologies by rating tranche.

country-years to be set to zero with no way of distinguishing them. Figure 6 presents a histogram of the different scores now being considered: *Linear50*, *Linear25*, *LOGSPLICED* and *LOGISTIC*.

Under the current scoring scheme, *Linear50*, 79.6% of the data points are scored 8.0 or higher, i.e. they appear among one of the first four tranches in Figure 6. All three alternative methodologies make a greater use of the distribution. *LOGISTIC* actually assigns the second highest percentage of data points to those three tranches (60.9%), but nearly 10 percentage points fewer are assigned to the highest tranche. *Linear25* also makes better use of the distribution overall, but over 5% of the data points are assigned a zero (or effectively a zero), greater than the other three methods. *LOGSPLICED* does 'best' in making the full use of the distribution and allowing different degrees of granularity in distinguishing between different kinds of 'very high rate of inflation'. But it achieves this by still assigning a rate of inflation of 25% a score of 3.86, which is of questionable face validity (although the current methodology assigns that a 5.00).

Linear50 seems unacceptable from the standpoint of face validity. *Linear25* is the 'easy' solution, but it punishes low levels of inflation and allows for no granularity at rates of inflation greater than 25%. *LOGSPLICED* and *LOGISTIC* are both modest improvements in terms of face validity over *Linear25*, but they are problematic for other reasons. *LOGSPLICED* provides a break in how inflation is treated at 2% that is unmotivated by our theoretical or philosophical understanding of economic freedom. The formula for *LOGISTIC* is likely too difficult to explain to a layperson. One of these options, however, should be preferable to *Linear50*.

One final suggestion that will not be pursued is to simply use three different formulas to splice four (inflation, score) points together: (0, 10), (2, 9.6), (25, 1), (100, 0). The benchmark values with this methodology are 9.80 for 1%, 9.60 for 2%, 8.60 for 4.70%, 5.28 13.55%, 1.00 for 25% and 0.67 for 50%. Arguably, this is incrementally better in terms of face validity than what we've achieved above, but in the limit, adding splices like this eventually becomes asserting a score for each and every value of inflation, which raises potential credibility issues.

Conclusion

This paper has attempted to provide a better mapping of rates of inflation to a zero-to-ten scale, as found in EFW. The current method of mapping rates of inflation to an index score made more sense at points in time when casually experiencing rather high rates of inflation was commonplace. Recent experience with elevated levels of inflation and little response by this variable has highlighted certain issues with the current methodology, which scores an inflation rate of 5% a nine out of ten and an inflation rate of 10% an eight out of ten.

A challenge faced is that the purpose of the variable is not to track which rates of inflation maximize macroeconomic performance, but rather to assess how well money works in service of property rights, the rule of law and supporting the functioning of markets. The closest modern statement of

how money can work in service of these ends can be found in Koyama and Johnson (2015). But using this framework means we are unable to use conventional macroeconomic literature on how to assess different rates of inflation, and we are mostly reliant on the very subjective quasi-methodology of face validity.

We consider several different means of improving on the current methodology used in EFW. A simple solution of simply changing the score that corresponds to zero from 50 to 25% does much to improve on what is currently wrong with the index. Introducing a simple change to its functional form – logging the variable – is not an improvement on it. An extremely massaged application of the logarithm, as well as a somewhat elaborate logistic functional form, appears to be modest improvements over simply changing the maximum value to 25%.

Balancing different objectives – maintaining high scores for very modest rates of inflation, tangibly reducing scores when they increase any further, scheduling still higher inflation rates to be scored reasonably and giving some preference for simplicity – meant that achieving face validity was not actually that simple of a task. We started with the observation that scoring the United States in 2021 a 9.06. In the end, the three methods that we settled on the best would score the United States an 8.12, 7.97 or an 8.43. And the method that appears best overall from the standpoint of face validity, *LOGISTIC*, reduces the score for the United States the least. On the one hand, the difficult on making more than a marginal improvement to the methodology is frustrating. But on the other, perhaps it is desirable that there are so few 'researcher degrees of freedom' to make adjustments to the index without introducing new problems into it.

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