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Assignats or death: The politics and dynamics of hyperinflation in revolutionary France☆

Bryan P. Cutsinger [a,b,*], Louis Rouanet [c], Joshua S. Ingber [d]

[a] Angelo State University, Department of Accounting, Economics, and Finance, San Angelo, TX 76909, USA
[b] Texas Tech University, Free Market Institute, Lubbock, TX 79409, USA
[c] University of Texas, El Paso, Department of Economics and Finance, El Paso, TX 79968, USA
[d] Northern Michigan University, Economics Department, 1401 Presque Isle Avenue, Marquette, MI 49855, USA

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ABSTRACT

Following a revolution precipitated by unsustainable government deficits, an explosion of paper money called the *assignat* caused a rapid increase in prices not seen in Europe again until the widespread adoption of discretionary fiat standards in the 20th century. The value of the *assignat* depended on the property the revolutionary government had expropriated to back it. The decision to retire the *assignats* from circulation using the revenue collected from the sale of the expropriated property was ultimately a political one. We examine how shifts in the political equilibrium affected the demand for the *assignat* and find evidence of two money demand shocks that correspond to the collapse of the political support for the *assignats*. Our estimates of the demand for the *assignat* indicate that the first shock reduced the demand for real balances by up to 70%. The second shock caused the negative relationship between real balances and inflation to break down entirely. Our results point to politics' critical role in determining a currency's fiscal backing and, thus, the demand for money.

> Let the French people know well that they need assignat or death.
>
> [Edmond Louis Alexis Dubois-Crancé, In front of the National Assembly, Ventôse 4, Year IV]

1. Introduction

Following a revolution precipitated by unsustainable government deficits, an explosion of paper money called the *assignat* caused a rapid increase in prices that would not be seen in Europe again until the widespread adoption of discretionary fiat standards in the 20th century (Bernholz, 2016; Sargent and Velde, 1995; White, 1995). Many economists have been critical of the monetary policy of the French revolutionaries, which should come as no surprise as it generated the first case of hyperinflation in Western

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* Corresponding author at: Angelo State University, Department of Accounting, Economics, and Finance, San Angelo, TX 76909, USA.
E-mail addresses: bcutsinger@angelo.edu (B.P. Cutsinger), lcrouanet@utep.edu (L. Rouanet), jingber@NMU.edu (J.S. Ingber).

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Europe (Aftalion, 1990; Crouzet, 1993; Gomel, 1902).[1] Yet the *assignat* had at least one great benefit: it spurred advances in monetary theory.

Henry (Thornton, 1802) used the *assignat* hyperinflation to illustrate how the expectation of future inflation leads to currency depreciation today. A year later, J.B. Say (1803) also argued that an increase in expected inflation would lead to a rise in velocity. "This", Say (1803, p. 142) argued, "was one of the causes of the prodigious circulation that took place during the progressive depreciation of the French assignats". Nassau (Senior, 1830) also mentions the *assignats* as an example of the link between expected inflation and velocity. In their analysis of the *assignat* hyperinflation, Emile (Levasseur, 1894) and R. G. Hawtrey (1918) discussed how unsustainable government deficits lead to inflation.

More recently, Brezis and Crouzet (1995) applied Cagan's (1956) model of the demand for money under hyperinflation to the *assignat*. They assumed the Cagan model applied to the entirety of the *assignat's* existence, but as (Sargent and Velde, 1995) have argued, the relationship between real balances and inflation varied with the monetary regime. In their view, the Cagan model applies only during the final years of the *assignat's* existence. Likewise, Bernholz (2016) argues that it was not until 1794 that the behavior of the real money stock was consistent with that observed during other episodes of hyperinflation.

We contribute to the *assignat* literature by examining how political support for the currency during the hyperinflation affected the public's demand for the *assignat*. The revolutionary government backed the *assignats* with the properties they expropriated from the clergy and nobles.[2] The *assignats* could be used to purchase this property at auction, which the revolutionary government used to retire the currency.[3] Thus, the *assignat* was a type of asset-backed money. However, rather than being backed by future taxes as in the case of colonial money in North America, for example, it was backed by the government's commitment to liquidate the expropriated properties using the *assignat* (Calomiris, 1988; White, 1995).[4] This commitment pinned down the future growth path of the *assignat*, and thus the public's demand for it. We argue that political support for using the expropriated properties to back the *assignat* collapsed during the hyperinflation and that this shift in political equilibrium caused demand for the revolutionary currency to collapse.

To examine the effect that weakening political support for the *assignats* had on the public's demand for *assignats*, we use Bai and Perron's (1998, 2003) method of estimating structural breaks. We identify two breaks in the relationship between real balances and inflation in June and November 1795 that correspond to a weakening of the *Jacobin* left—the *assignat's* primary political supporters. The first structural break in June 1795 corresponds to a failed insurrection and the subsequent weakening of the *assignats*' asset backing. The second break in November 1795 corresponds to the establishment of a new political regime: the Directory—an event that portended the *assignat's* eventual demonetization.

We use the empirical methods proposed by Taylor (1991) and Engsted (1998) to estimate *assignat* demand between May 1794 and May 1796. Our results indicate that the behavior of real balances and inflation was consistent with the Cagan model of money demand until the establishment of the Directory in November 1795. At this point, the relationship between real balances and inflation breaks down. We also find that the weakening of the Jacobin Left's control over the legislature around late May/early June 1795 caused a negative money demand shock that reduced real balances by as much as 70%. As a result, the maximum potential annual seigniorage revenue fell from around 2 billion pounds in specie (33% of GDP) to roughly 800 million (14% of GDP). In short, the erosion of the *assignat's* political support brought about a contraction of the inflationary tax base, thereby worsening the already disastrous fiscal condition of the revolutionary government. By the end of the *assignat* hyperinflation, seigniorage alone could no longer cover current expenses.

Our analysis also contributes to the literature on inflationary finance started by Cagan (1956) and Bailey (1956).[5] Most of the research in this area ignores the political economy of inflationary finance.[6] This neglect is surprising given the link between political instability and inflationary finance (Aisen and Veiga, 2006, 2008; Cukierman et al., 1992).[7] Failing to account for instability in the "rules of the game" underlying the money-creation process could result in biased estimates of the demand for money (Barro, 1983; Brennan and Buchanan, 1980, 1981). Our analysis highlights this issue by quantifying the effect that changes in the political equilibrium can have on the demand for money and the importance of incorporating such changes into the analysis of inflationary finance.

Finally, we are able to contribute to the debate over asset-backed money in the American colonies. Backing theorists argue, contrary to the quantity theory, that the public's expectations about future taxation, rather than increases in the growth rate of the

[1] Moreover, it left France with no option but to resort to taxation to fund its war with the British, who, in contrast to France, were able to fund the war through borrowing and inflationary finance (Bordo and White, 1991; Bordo and Kydland, 1995). The Swedes faced a similar challenge as the French: they could not create a central bank capable of financing war (Hendrickson, 2020).

[2] This expropriation had substantial and long-lasting effects on agricultural productivity (Finley et al., 2021).

[3] As we explain below, the *assignats* were not redeemable for a fixed amount of land. Instead, the amount of land an *assignat* could purchase varied over time.

[4] Following (Sumner, 1993), we differentiate between three types of backing. The first is commodity backing. This type of backing involves notes or deposits redeemable on demand for a specified amount of the monetary commodity, e.g., gold. The second type of backing involves notes or deposits redeemable in the future for a specified amount of the monetary commodity. The Confederate grayback is an example of this type of backing. The third type of backing involves government commitments to retire newly-created currency through future taxes. The *assignat* was a variation of this third type of backing.

[5] This approach has been extended theoretically and empirically and to a range of hyperinflationary episodes. See, for example, Barro (1972), Engsted (1993, 1994, 1996), Frenkel and Taylor (1993), Miller and Ndhlela (2020), Mladenović and Petrović (2010), Petrović and Vujošević (1996), Petrović and Mladenović (2000), and Phylaktis and Taylor (1993).

[6] There are exceptions, of course. See, for example, Cutsinger and Ingber (2019), Michael et al. (1994), Pittaluga et al. (2020) and Sargent (1982). Financial innovation in response to high inflation can also destabilize the demand for money (Arrau and De Gregorio, 1993; Arrau et al., 1995).

[7] See also: Blau et al. (2022) and Nguyen et al. (2022).

money stock, drove inflation during this period (Calomiris, 1988; Grubb, 2006, 2016a,b, 2017, 2018, 2019; Smith, 1985a,b; West, 1978; Wicker, 1985). Quantity theorists counter by arguing that because the colonies were essentially small open economies with a fixed exchange rate between paper money and specie, the correct test of the quantity theory is between changes in the money stock and specie flows, and that, consistent with the quantity theory, once scholars account for this issue, there exists an inverse relationship between real balances and inflation (McCallum, 1992; Michener, 1987, 1988, 2015, 2019; Michener and Wright, 2006).

One challenge that economic historians working on this topic have faced is a lack of high-frequency data, making it difficult to pinpoint when changes in the backing of these currencies occurred and the extent to which these changes affected money demand.[8] Since we use relatively high-frequency money supply and price-level data, our paper can contribute to this debate by highlighting both the quantity- and backing-theoretic aspects of asset-backed money. Our empirical analysis demonstrates that consistent with the quantity theory, there was a negative relationship between the real value of the *assignats* and the inflation rate. Nevertheless, we also find that this relationship ultimately depended on the assets backing the *assignats*, which is consistent with the backing theory. Thus, this paper provides empirical support for a combination of the backing- and the more traditional quantity-theoretic approaches to money demand—a point that other quantity theorists have made (Bernholz, 1988; Laidler, 1987; Sumner, 1993).[9]

2. The *assignats* from their creation to hyperinflation

2.1. The fiscal crisis and the creation of the assignats

A fight between the King and the parliament of Paris regarding public finances first triggered the French Revolution.[10] By 1788, government deficits were no longer sustainable. More than 20% of government revenue came from borrowing. Nearly 50% of government spending consisted of debt and interest payments (Braesch, 1934). The King summoned the Estates Generals in a desperate attempt to solve the regime's fiscal problems. As a member of the Committee of Finances in the Legislative Assembly later declared, by 1789, even "loans, fatal and last resource of our finances, had become impossible" (Montesquiou, 1791, p. 8).

The Estates Generals quickly bogged down in a conflict about voting procedures between the clergy, the nobility, and the third-estate. This conflict led members of the third-estate to break away from the two other estates and to declare themselves the National Assembly in June 1789. Nevertheless, the new parliament inherited the "unpleasant fiscal arithmetic" that gripped the *Ancien Régime* (Sargent and Velde, 1995). The situation seemed hopeless. In November 1789, Montesquiou (1789) spoke in front of the National Assembly and informed his colleagues that the debt due amounted to 557 million pounds, more than one entire year of revenue. Worse still, the government was on the wrong side of the bond finance "Laffer curve". In August 1789, Jacques Necker, the minister of Finances, tried to open two loans, one for 30 million pounds at 4.5% interest and another for 80 million at 5%. Both attempts failed to raise the revenue announced. Having recognized his mistake, Necker reported to the Assembly on September 24 that "new loans can only increase the current deficit" (*Archives Parlementaires* 9:143).

By the end of the Summer of 1789, some members of the newly created National Assembly started to suggest that the assets owned by the clergy could be seized by the state and auctioned to address the deficit (Crouzet, 1993). On November 2, 1789, the Assembly voted for the nationalization of the ecclesiastic properties—568 votes in favor and 346 opposed. While expropriating the Church's assets helped the government remain solvent, resources were still needed to pay the debt due. The new "national assets" could not be auctioned off fast enough to repay creditors.

A debate about how to cover the current deficit ensued. "The question", said Roederer to his colleagues in the National Assembly, "is how are you going to meet the needs of the moment, regardless of taxes" (*Archives Parlementaires* 10:280). On November 27, 1789, the Assembly first discussed a project proposed by Necker that would have transformed the Caisse d'Escompte into a national bank issuing paper money loaned to the government. Many revolutionaries, however, perceived the Caisse as an institution loyal to the *Ancien Régime*, and the Assembly rejected Necker's proposal (Crouzet, 1993). Instead, the Assembly created the *assignats* on December 19, 1789.

The government did not initially intend for the *assignats* to be money but instead used the *assignats* as a debt instrument (Crouzet, 1993, p. 107). The first issues of the *assignats* were negotiable instruments with space on the back where owners would sign their names. Until October 8, 1790, the *assignats* issued also bore interest—5% until April 1790, 3% afterward.[11] Nor did the government intend to use the *assignats* to finance the primary budget deficit. Their intended purpose was to assist in liquidating the existing public debt (Sargent and Velde, 1995; Crouzet, 1993).

To accomplish this task, the government permitted people to use the *assignats* in combination with, or instead of specie, to purchase the expropriated church assets at auction, which determined the assets' sale price.[12] Bidding with one pound of specie was as good as bidding with one pound of *assignat*. The government would retire the *assignats* used in payment from circulation. When specie was used in payment instead, the government would exchange it for *assignats* and retire them. Thus, the *assignat* was not

[8] Cutsinger et al. (2022) is one notable exception. However, their analysis focuses on colonial Canada rather than America.

[9] Rousseau (2007) takes a similar middle ground in this debate. However, rather than arguing that the effect of a change in the asset backing of a particular currency is consistent with the quantity theory, he argues that the backing theory can explain why changes in the money supply do not affect the price level in the short run, but that in the long run, the quantity-theory relationship still dominates.

[10] See Jaaidane et al. (2023) for an interesting analysis of the political economy of the relationship between French parliaments and the King.

[11] Dupont de Nemours rightfully explained in front of the Assembly that if the government repaid the debt with *assignats* bearing no interest, this would amount to a partial bankruptcy (*Archives Parlementaires* 9:158-159).

[12] Sargent and Velde (1995) provide a detailed account of how the government auctioned the church assets.

redeemable for a fixed amount of land in the same sense that a person could redeem paper money for a fixed quantity of gold under the gold standard. Instead, the amount of land an *assignat* could purchase varied with the sale price determined at each auction.

No automatic mechanism ensured the real value of the *assignat* would remain within a narrow band of the value of church assets. Nonetheless, the *assignats* were initially as good as gold when it came to purchasing church assets because the auction mechanism fixed the real value of the *assignats* to its value as a means of purchasing church assets.[13] Since the *assignats* were perfect substitutes for specie when it came to purchasing church assets, the real value of the outstanding stock of *assignats* would be equal to that of the expropriated clergy properties. This feature was sufficient to give the *assignats* value.

The idea that the government can make paper money valuable by allowing people to extinguish their tax obligations goes back to at least Adam Smith (1776).[14] The French Revolutionaries adapted this mechanism by making the *assignats* receivable for the payment of church property during their privatization instead of taxes. By doing so, the government overcame the difficulty of ensuring the acceptability of new money by becoming the "buyer of last resort" of the *assignat*, solving the final-period problem inherent to getting new money off the ground.[15] So long as the nominal value of the outstanding stock of *assignats* was equal to the present value of future currency retirements, they would trade at par with specie. If, however, the government could not credibly commit to keeping the nominal value of the outstanding stock of *assignats* equal to the present value of future currency retirements, the *assignats* would trade at a discount relative to specie.

The December 19–21, 1789 decrees planned the concomitant sale of church assets and the issue of *assignats* for 400 million pounds. In these initial decrees, the government announced that it would retire this issuance within five years. However, the government repealed this deadline by a decree in April 1790. Nonetheless, this decree ordered that the government burn the *assignats* each time people used *assignats* to purchase church assets at auctions. As Sargent and Velde (1995, p. 515) explain: "When payment was made in assignats, the assignats were canceled immediately and then sent to Paris for burning. When payment was made in coin, the coins were sent to Paris and exchanged for assignats held by the Treasury, then canceled and burned".

The commitment to retire the *assignats* from circulation meant that their real value would equal the present value of church assets. By definition, the real value of currency retirements (s_t) implies that:

$$\frac{M_t}{P_t} = \frac{M_{t-1}}{P_t} - s_t \tag{1}$$

where M_t is the nominal supply of *assignats* at time t and P_t is the price level. Since the revolutionary government could scarcely rely on borrowing to finance the deficit but instead had to rely on issuing *assignats*, s_t can be interpreted as the real surplus of tax revenue over government spending, including debt service. Iterating Eq. (1) forward and solving for the real supply of *assignats*, we get:

$$\frac{M_t}{P_t} = \sum_{i=1}^{\infty}\left[\prod_{j=1}^{i}\left(\frac{P_{t+j}}{P_{t+j-1}}\right)\right]s_{t+i} = \sum_{i=1}^{\infty}\frac{s_{t+i}}{R^i} \tag{2}$$

where R is the gross interest rate, which we assume to be constant for simplicity. In this case, people are willing to hold interest-free *assignats* "overnight" only if the rate of return is equal to that on alternative assets.[16] To the extent that real currency retirements are equivalent to real primary surpluses, the real value of the *assignats* is equal to the present value of future budgetary surpluses. One implication of this relationship is that changes in these surpluses will affect the real value of the outstanding stock of *assignats*.

However, changes in the future budgetary surpluses are not the only factor that could affect the value of the *assignats*. For instance, the government could opt to default on the *assignats* by refusing to retire the currency as planned after it has gained widespread acceptance to fund additional spending or honor its other liabilities. As we explain below, the Directory's decision to demonetize the *assignats* unsurprisingly resulted in a collapse of the monetary demand for the *assignats*. However, this decision also corresponds with a substantial increase in the price of the government's bonds, which suggests that future budgetary surpluses were not the only factor determining the real value of the *assignats* (see Fig. 6).

Some economists have argued that church assets could have maintained the value of the *assignats* only if they had been redeemable in fixed quantities against clergy property (Say, 1803; Wicksell, 1968). The backing theory we have described thus

[13] According to Calomiris (1988), colonial money in North America worked similarly, except instead of relying on the sale of assets to fix the marginal value of the currency, the government relied on taxation so that the marginal value of the currency was equal to its specie value in the payment of taxes. The *assignats* became receivable in the payment of taxes with a decree passed on September 12, 1790. However, the government did not burn the *assignats* used in paying taxes, and thus they remained in circulation. In that sense, the French National Assembly backed their *assignat* liabilities by a specific revenue stream—the sale of church assets.

[14] This idea is at the core of the backing theory of money and the more recent fiscal theory of the price level. While similar in some respects, the two theories differ in others. The backing theory holds that the value of the assets backing money determines its value (Bernholz, 1988; Calomiris, 1988). The fiscal theory of the price level holds that the value of money varies with the present value of the issuing government's primary surpluses (Cochrane, 2011, 2022; Davig et al., 2011). In the present context, it is not difficult to imagine scenarios that could have weakened the government's commitment to retire the *assignats* from circulation that do not affect the present value of the revolutionary government's primary surpluses. Since our goal is to uncover how changes in the political support for retiring the *assignats* affected the asset backing and thus the demand for the revolutionary currency, we frame the remainder of our discussion around the backing theory.

[15] The final-period problem refers to the idea that if people expect money to become worthless in some future period, backward induction implies that they will refuse to accept it in the present period. As a result, the money becomes worthless in the present period. See Selgin (1994) and the references cited therein for more details on the challenges of getting new money off the ground.

[16] In other words, the equilibrium condition $\frac{1}{R} = \frac{P_{t+j}}{P_{t+j-1}}$ must hold.

far suggests otherwise. By accepting *assignats* in payment for church assets and by credibly committing to retiring the *assignats* from circulation after receiving them in payment for these assets, the *assignats* became a perfect substitute for specie. Thus, as long as the face value of outstanding *assignats* was less than or equal to the specie value of church assets sold, they would trade at par with gold.

Consider an example where the specie value of church assets is 10 million pounds, and *assignats* have no other use than buying church assets. If the government issues 9 million pounds of *assignats*, they will trade at par with gold when the church assets are auctioned off. Since the nominal amount of *assignats* is less than the specie value of church assets, 1 million of specie will also be used in the auction. In this case, the *assignats* will be as good as gold at auction. Suppose the supply of *assignats* exceeds 10 million. Under these circumstances, people will cease using specie in auctions entirely, opting instead to purchase church assets with *assignats*, which will depreciate as the price of church assets is bid up. If 100 million pounds of *assignats* are issued, then, in equilibrium, the *assignat* price of specie will be 10 to one. Alternatively, suppose the government issues 100 million pounds worth of *assignats* that can only be used to purchase church assets at auction one year hence. In this case, the *assignat* must appreciate at a rate equal to the rate of return on alternative assets. Otherwise, people would not be willing to hold positive quantities of *assignats*. For instance, in our example, if the real interest rate is 10%, the equilibrium *assignat* price of specie must be 11 to one in the current period.[17]

Between January and December 1791, the *assignats* only depreciated by 4.3% despite the quantity of *assignats* increasing by nearly 250% over this same period, reaching 1,360 million pounds in December (Crouzet, 1993).[18] Our interpretation of the relative stability in the value of the *assignats* is that they were, above all, a government liability. In that context, exchanging *assignats* for government bonds would not affect the price level, provided the specie value of the church assets is at least equal to the face value of the outstanding stock of *assignats* (Wallace, 1981; Sargent and Smith, 1987). Indeed, it is this interpretation that Dupont de Nemours, economist, and member of the National Assembly, had in mind when, in September 1789, he said in front of the parliament: "In the position you are in, the paper you would spread; whether it bears interest, or that it does not bear interest, would never be anything but a debt security, exchanged for another debt security". (*Archives Parlementaires* 9:158).

If, for instance, the French government retires 10 million pounds of government bonds by issuing 10 million pounds of *assignats* while the specie value of church assets remains constant, then the present value of future issues of *assignats* will fall by 10 million pounds as well. Thus, provided the path of fiscal policy does not change, issuing more *assignats* by purchasing government bonds means a lower supply of *assignats* in the future, which prevents prices from rising today by lowering expected inflation. Only permanent increases in the money supply would lead to a proportionate increase in the price level (Sumner, 1993). Since most of the *assignats* issued initially were backed by the government's commitment to retire the current issues of *assignats* by selling church property, prices did not drastically increase in the early years of the *assignat's* existence.

2.2. The assignat hyperinflation

According to Sargent and Velde (1995), the government respected the primary function of the *assignats*—i.e., liquidating the public debt—until April 1792, when public spending surged following the beginning of hostilities against the first coalition. Indeed, the declaration of war in April 1792 triggered an almost ten-fold increase in the "real" deficit (Fig. 1). Once it became clear that the *assignats* would finance the deficit while a tax reform stalled, inflation started to increase.[19] As early as 1793, Saint-Just argued in a letter that France was already in a hyperinflation dynamic. "The more assignats we create", Saint-Just argued, "the more the relative value of specie increases, and the more specie increases, the more assignats must be created". (Gross et al., 1962, p. 225).

The depreciation of the *assignats* after the beginning of the war was twice interrupted by periods of appreciation when the value of "national assets" used to retire *assignats* from circulation increased. For instance, in September 1792, the government expropriated the properties of the *émigrés*—i.e., those who left France out of fear or for ideological reasons. These assets, referred to as national assets of second origin, bolstered the asset backing of the *assignats*. In some regions, such as Gironde, the second origin assets represented almost 40% of all national assets sold during and after the Revolution.[20] Between August and September 1792, the *assignats* appreciated by 18% (Caron, 1909).

Similarly, the *assignats* appreciated in the second half of 1793. The reason is straightforward: by March 1793, the French government had annexed the county of Nice, Savoy, Belgium, and some German territories. This annexation increased the prospect of greater asset backing for the *assignats*, especially with the nationalization of church assets in those territories. On March 8, a Parisian newspaper noted: "[W]e do not doubt that with the immense resources from ecclesiastical assets in the Austrian Netherlands, which under this aspect Cambon calls the promised land of the revolution, in the bishopric of Liège, duchy of Savoy, county of Nice etc., etc. the backing of our assignats is tripled and that they take back their first favor".[21] The *assignats* indeed appreciated.

Inflation started to increase dramatically after the Fall of Robespierre in July 1794, and by the beginning of 1795, France was in a hyperinflationary dynamic that would last until April 1796. By the end of 1794, the deficit was out of control, tripling from

[17] If the *assignats* provide liquidity services, however, they need not appreciate at a rate equal to the interest rate.

[18] For comparison, Crouzet (1993) estimates that in December 1790, the amount of specie in circulation was roughly 1,300 million pounds.

[19] By November 1792, some parliamentarians such as Jacob Dupont complained about the "lack of attention" given to recovering taxes. (*Archives Parlementaires*, 53:384).

[20] See Appendix E.

[21] *La Révolution de 92, ou Journal de la Convention Nationale*, n°170, March 8, 1793. p. 2–3.

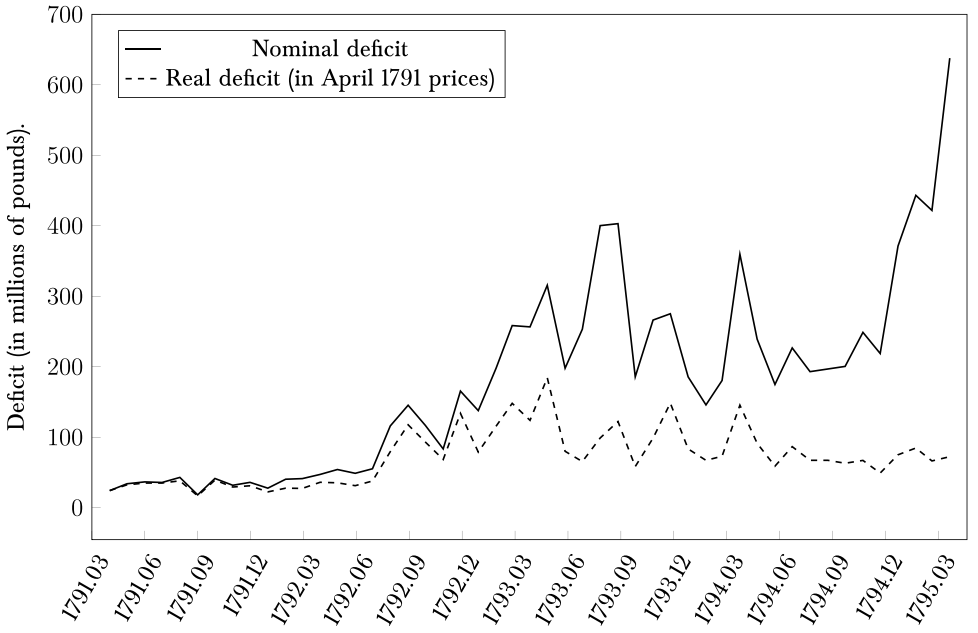

Fig. 1. Monthly government deficit.
Source: Archives Parlementaires.

219 to 638 million pounds from December 1794 to April 1795 (Fig. 1). Tax collection at that point was virtually nonexistent. Taxes covered only 12% of total government spending in February 1795, 9.9% in March, and 6.4% in April.[22]

Although we do not have data about the monthly deficit after April 1795, we know how much the government relied on inflationary finance. Fig. 2 calculates the weekly real seigniorage revenue expressed in December 1790 prices.[23] On average, the French government raised real seigniorage equivalent to 15.2 million pounds from December 1790. In comparison, in 1790, the French government spent 690.7 million pounds (Braesch, 1934), or an equivalent of 13.3 million pounds per week—represented by the horizontal line in Fig. 2. In other words, seigniorage alone was sufficient to finance a level of public spending greater than the 1790 budget for most of the period we study.

2.3. The economics and politics of the assignat hyperinflation

The *assignat* hyperinflation is peculiar as it overlaps with a constitutional change.[24] In the first days of November 1795, a new regime, with a new constitution and legislature, was established. This change was characterized by the unfolding of a long and turbulent struggle between different factions in the National Assembly, especially between the *Girondins* and *Jacobins*. The new regime reflected a change of attitude toward the *assignat* (Levasseur, 1903; Crouzet, 1993). Political support for the paper money weakened as the *Jacobins*, who had relentlessly supported the interests of *assignats* holders, lost their grip on the reins of power.[25] Simultaneously, the advent of the Directory increased the political influence of the monarchists, which meant that the asset backing of the *assignats* was now in question, especially as the assets owned by nobles who emigrated abroad and the royal domain were expropriated and considered "national assets". The establishment of the Directorial regime likely meant the *assignat*'s days were numbered, and consequently, the demand for paper money collapsed.

The classic work on inflationary finance by Cagan (1956) and Bailey (1956) assumes that the demand for money is stable. The Cagan-style money demand function can be represented as follows:

$$\frac{M_t}{P_t} = L(i_t; y_t) \tag{3}$$

where M_t/P_t represents the real money supply, i_t represents the nominal interest rate, and y_t represents income. Cagan argued that because inflation swamps the effect of both changes in the real interest rate and income in times of hyperinflation, we can represent money demand as a simple function of expected inflation.

[22] For February, see *Le Moniteur Universel*, n°165, March 5, 1795, p. 595. For March see: *Journal des débats et des décrets*, n°912, p. 134–135. For April see: *Collection générale des décrets rendus par la convention nationale* Vol. 61 (Floréal an III; 20 avril–19 mai 1795), p. 58–59.

[23] Following Sargent and Velde (1995), we estimate real seigniorage as being equal to $\frac{M_t - M_{t-1}}{0.5(P_t + P_{t-1})}$. Weeks here are "revolutionary" weeks and differ from the Gregorian calendar in that they are 10 days long instead of seven.

[24] The Hungarian hyperinflation is also peculiar in this regard.

[25] We document this change in political equilibrium within the parliament with the advent of the Directory in Appendix C.

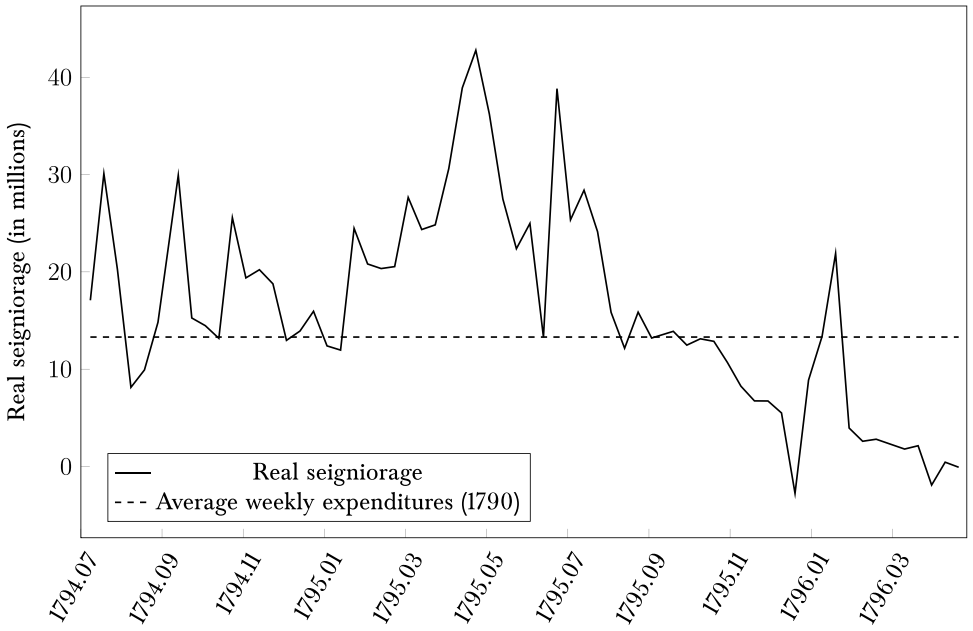

Fig. 2. Real seigniorage in December 1790 Pounds.
Source: de Nogaret (1800), Caron (1909).

The presence of a stable money demand function is a testable proposition. Our econometric analysis in Section 5 indicates that a stable money demand function for *assignats* was regime dependent. Changes in the political equilibrium led to either a shift in the demand for money or a complete collapse in the negative relationship between inflation and real money balances. In Section 5, we identify two structural breaks in that relationship. One around November 2, 1795, corresponds to the establishment of the new Directorial regime. The other, on June 9, 1795, corresponds to a failed *Jacobin* insurrection and the subsequent restitution of a portion of the "national assets" to their prior owners.

The change in the political equilibrium brought about by the Directory weakened the asset backing of the *assignats* and induced fears that they would be demonetized. As a result, after November 1795, the liquidity services provided by the *assignats* declined sharply. An increasing portion of the population refused to accept the *assignats* in payments.[26] The result was a complete breakdown of the negative relationship between inflation and real money balances. The *assignats* increasingly became speculative assets. Their value varied with variations in the expectation that they would be retired from circulation through the sale of national assets.

Suppose the *assignats* stopped being valued as money. In that case, there is no particular reason to believe we would observe a negative relationship between real money balances and inflation in the data after the establishment of the Directory. Changes in the expected present value of future currency retirements will affect prices and therefore observed inflation. However, this kind of inflation is fully unexpected and does not affect the real value of the stock of *assignat* at time t. In the absence of money demand for the *assignats*, the expected inflation rate is the negative of the real interest rate. The *assignats* can only depreciate if there are (unexpected) changes in the expected present value of future currency retirements. We can rewrite Eq. (2) as follows:

$$\frac{M_t}{P_t}\Delta E_{t+1}\left(\frac{P_t}{P_{t+1}}\right) = \Delta E_{t+1}\sum_{i=0}^{\infty}\frac{s_{t+1+i}}{R^i} \tag{4}$$

where $\Delta E_{t+1} = E_{t+1} - E_t$. Since at time $t+1$, M_t, and P_t are already determined, unexpected inflation results from changing expectations about the present value of future currency retirements. Additionally, unexpected inflation, in this case, is not negatively related to real money balances (M_t/P_t). Suppose we are right that the constitutional change in November 1795 was associated with weakening the asset backing and liquidity demand for *assignats*. In that case, we should expect a weakening in the negative relationship between expected inflation and real money balances and a fall in real money balances. As we demonstrate below, the evidence is consistent with our hypothesis.

The relationship between the value of national assets and the *assignats* was known by most politicians during the Revolution, as can be verified by many speeches in front of the parliament. To pick only a few examples, in December 1795, Lafond-Ladébat declares that "from the moment that a single assignat was issued beyond the real value of National property, the barrier of public

[26] This was especially true the further away you moved from Paris: "[W]e do not quote prices [of wheat] in assignats". (*Journal de Marseille*, October 11, 1795, p. 348).

order was broken; and the degradation of the assignats became all the more rapid".[27] The same month, Ramel noticed when speaking in front of the Assembly that the decision, taken on November 25, 1795, to give soldiers some of the national assets worth one billion in specie reduced the asset backing of the *assignats* and contributed to their depreciation.[28]

3. The demand for money during hyperinflation

The standard approach to estimating the demand for money during hyperinflation originated with Cagan's (1956) study of several European hyperinflations. When prices are rapidly increasing, Cagan argued, the effect of real factors on the demand for money can safely be ignored because the effect that changes in these factors would have on the demand for money would be minuscule compared to the effect brought about by people's inflation expectations. Thus, Cagan proposed a money-demand function where the primary determinant of the demand for real balances is the expected rate of inflation.

Cagan's (1956) model of the demand for money during hyperinflation can be written as:

$$m_t - p_t = -\alpha[E_t p_{t+1} - p_t] + u_t \tag{5}$$

where m and p denote the natural logarithms of the money supply and price level, respectively, α is the semi-elasticity of the demand for real balances with respect to expected inflation, E_t is the conditional expectation operator, and u_t is a random disturbance term capturing the effect of money-demand shocks.[29]

As shown by Taylor (1991), we can rewrite Eq. (5) to illustrate the conditions under which Cagan's model can be consistently estimated:

$$(m_t - p_t) + \alpha \Delta p_t = -\alpha \Delta^2 p_{t+1} + (u_t - \alpha \eta_{t+1}) \tag{6}$$

where Δ is the first-difference operator and η_{t+1} is the forecast error, i.e., $\eta_{t+1} = (p_{t+1} - E_t p_{t+1})$, which we assume is stationary. If we further assume that money-demand shocks are also stationary and real balances and inflation are $I(1)$ processes, then Eq. (6) indicates that the linear combination of $(m_t - p_t) + \alpha \Delta p_t$ will also be stationary. Under these conditions, real balances and inflation will be cointegrated, and thus Eq. (5) can be estimated super-consistently regardless of how people form their inflation expectations and despite the presence of simultaneity or omitted variable bias (Stock, 1987).

We can take the analysis a step further, however. Suppose the money market is always in equilibrium, and people form their expectations rationally. In this case, the price level at time t is a function of the contemporaneous money supply and people's expectations of the future path of the price level. Under these assumptions, Eq. (5) can be rewritten with p_t on the left-hand side and solved recursively forward yielding:

$$p_t = (1 - b) \sum_{i=0}^{T-1} b^i E_t(m_{t+i} - u_{t+i}) + b^T E_t p_{t+T} \tag{7}$$

where $b = \alpha/(1 + \alpha)$. If we rule out the possibility of rational bubbles by imposing the transversality condition $\lim_{T \to \infty} b^T E_t p_T = 0$,[30] then Eq. (7) can be simplified to yield:

$$p_t = (1 - b) \sum_{i=0}^{\infty} b^i E_t(m_{t+i} - u_{t+i}) \tag{8}$$

Following Engsted (1993), Eq. (8) can be rewritten to highlight another implication of the Cagan model:

$$(m_t - p_t) + \alpha \Delta m_t = -(1 - b)^{-1} \sum_{i=1}^{\infty} b^i E_t \Delta^2 m_{t+i} + (1 - b) \sum_{i=0}^{\infty} b^i E_t u_{t+i} \tag{9}$$

Eq. (9) implies that if money-demand shocks are stationary and the growth rate of the nominal money supply is an $I(1)$ process, then the linear combination of $(m_t - p_t) + \alpha \Delta m_t$ will also be stationary. Thus, the Cagan model under the assumption of continuous market clearing, rational expectations, and no rational bubbles implies that real balances and the growth rate of the money supply will also be cointegrated, with a cointegrating parameter equal to that found by estimating Eq. (5).

In sum, if real balances and inflation during the final years of the *assignat's* existence are both $I(1)$, and if there is evidence of a cointegrating relationship between the two series, i.e., u_t is $I(0)$, then Cagan's model of the demand for money applies to the *assignat* hyperinflation. Moreover, if the growth of the *assignats* during this period is $I(1)$, and if there is evidence of a cointegrating relationship between their growth rate and real balances, then we can rule out the possibility that self-fulfilling expectations were driving the rapidly increasing price level during the *assignat* hyperinflation. As we describe in Section 5, we find that these conditions do apply the *assignat* hyperinflation. We thereby can estimate the demand for the revolutionary currency. Before proceeding further, however, a brief description of the available data from that period is in order.

[27] *Le Moniteur Universel*, n°78, December 9, 1795. See also Lecouteux de Canteleu's (who later became one of the founders of the Bank of France) intervention on December 9, 1795, in front of the Assembly.

[28] *Le Moniteur Universel*, n°85, December 16, 1795.

[29] We have omitted the constant term for notational simplicity. However, we include a constant in our empirical analysis.

[30] This limit is zero except if the log of the price level p_t grows exponentially at a rate greater than $(1 + \alpha)/\alpha$, which would imply that the level of prices grows at an ever-increasing rate.

4. Data

Estimating the demand for money during the *assignat* hyperinflation requires data on the stock of *assignats* and the price level. Our measure of the supply of *assignats* comes from data copied from the Treasuries registers by Ramel (de Nogaret, 1800). This series begins on May 10, 1794, and ends on May 10, 1796.[31] To measure the price level, we use data from Caron (1909) on the *assignat* price of specie (*numéraire*) over that same period.[32] The *assignat* price of gold tracks the prices of other commodities published in *Le Moniteur Universel* between August and December 1795 quite closely and is thus a suitable measure of the price level in our opinion (see Appendix A).[33]

Ramel (de Nogaret, 1800) estimated the supply of *assignats* by taking the difference between the number of *assignats* burnt and the number issued by the Treasury and reported these estimates at 10-day intervals.[34] While prior work on the *assignat* has used de Nogaret's data at a monthly frequency, e.g., Sargent and Velde (1995), we use this data in its original form. Our reason for doing so is that lower-frequency data can produce misleading results when identifying changes in the demand for money, as people adjust their money balances more rapidly during periods of severe inflation (Mladenović and Petrović, 2010).[35]

Caron's (1909) data reports the quantity of specie that could be purchased with 100 pounds of *assignats*. This data comes from the *Tableaux de Dépréciation*—a table listing the prices of gold, foodstuff, real estate, and other commodities that enabled debtors who had contracted their debt in *assignats* to settle their debt. The law of June 23, 1797, required each department to collect these figures to account for the depreciation of paper money. White (1991, p. 245) argues that the departmental figures are "a fairly accurate measure of inflation [...], particularly during the last and most rapid phase of inflation". We use price data for the department of the Seine, i.e., Paris, as the price series for the other departments are much less comprehensive.

Using the *assignat* price of gold as a measure of the price level is further justified by the tendency for the medium of account and the medium of exchange to separate during periods of severe inflation (McCallum, 1989, p. 18). Indeed, by the end of 1795, many merchants quoted the prices of goods and services in terms of gold but continued to accept the *assignat* as a means of payment until 1796—at least in Paris. For example, a police report from December 9, 1795, describes how "if they [Parisian Merchants] sell for *assignats*, it is only after having calculated the numéraire they worth at the stock exchange." (Aulard, 1899, p. 489).[36]

To construct a measure of real balances, we use de Nogaret's estimates of the stock of outstanding *assignats* and deflate these estimates using Caron's data on the *assignat* price of gold. We also use Caron's data to create a measure of inflation, which we calculate as the first difference of the natural logarithm of the *assignat* price of gold. Fig. 3 illustrates the time paths of both series. The behavior of real balances and inflation during the *assignat* hyperinflation is similar to that of the 20th-century episodes of hyperinflation originally studied by Cagan (1956)—real balances decreased relatively slowly at first and then fell substantially as inflation both increased and became more volatile.

5. Empirical analysis of the demand for *assignats*

5.1. Asset backing and the demand for assignats

Cagan's (1956) model of money demand during hyperinflation posits a negative relationship between real balances and expected inflation. Before we estimate this relationship, however, we need to assess whether changes in the *assignat's* asset backing affected the demand for the revolutionary currency, as failing to account for such changes could bias our estimates of the demand for *assignats*. To do so, we begin our analysis by testing for structural breaks in the relationship between real *assignat* balances and inflation without imposing known break dates. Other researchers have used this approach to capture the effect of changes in the asset backing of other currencies—two notable examples being (Weidenmier, 2002) and Willard et al. (1996).

We use the method proposed by Bai and Perron (1998, 2003), which permits multiple structural breaks in a linear model estimated by least-squares.[37] This dynamic algorithmic method is less sample dependent than other structural break tests. It allows a subset of the parameters to remain constant, which yields efficient breakpoints that minimize the sum of the squared residuals. In addition, this method yields estimates of confidence intervals regardless of the data structure and error distribution. Our tests identified two structural breaks in the relationship between real balances and inflation: one on June 9 and another on November 2, 1795. As Table 1 illustrates, the test statistic is significant at the 99% level, and both dates exhibit a tight, two-period confidence interval.

[31] Sargent and Velde (1995) argue that the beginning of the period best described by Cagan's model starts with the death of Robespierre on July 28, 1794. Changing the starting date of our sample to this date leaves all of the results presented in the rest of the paper virtually unchanged.

[32] Gold was widely used as a medium of exchange. For instance, in 1798, Crétet declared in front of the *Conseil des Ancients* that "the most important commerce, that of agricultural goods, is almost exclusively done with gold". (cited in: Crouzet Crouzet, 1993, p. 34).

[33] Those data are consistent and complied with the data published in the *Journal de Paris* during the same period.

[34] The idiosyncrasies of the French revolutionary calendar means that each week is 10 days long.

[35] When converted into a monthly series, the data given by de Nogaret (1800) is nearly identical to the data used by White (1987). The correlation coefficient between the two series is 0.999, and the correlation coefficient between their growth rates is 0.973. The two series have a one-day lag. While (de Nogaret, 1800) reports the money supply data on the 1, 11, and 21 days of the month, White (1987) reports the money supply on the last day of the month (the 30th). To calculate the correlation coefficients, we matched the data from the 30th with the data from the 1st.

[36] See also Aulard (1899, p. 508)

[37] We used the Stata package provided by Ditzen et al. (2021) to conduct the structural break tests.

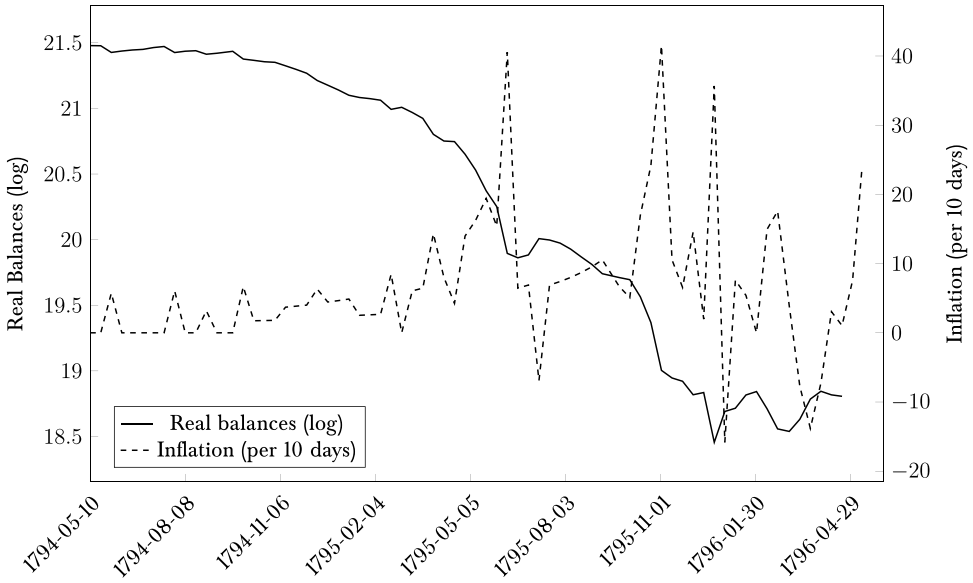

Fig. 3. Real balances and inflation.
Source: Caron (1909) and de Nogaret (1800).

Table 1
Structural break tests.

Relationship Tested	Test statistic	1st Estimated Break Date	2nd Estimated Break Date	99% confidence intervals
$m_t - p_t$ and Δp_t	651.94***	June 9, 1795	November 2, 1795	+/−10 days
$m_t - p_t$ and Δm_t	640.74***	May 30, 1795	October 23, 1795	+/−10 days
$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$				

Notes: The sample runs from May 10, 1794 to May 10, 1796. $m_t - p_t$ denotes real balances, Δp_t the inflation rate and Δm_t the growth rate of the *assignats*.

As we describe in Section 3, under certain assumptions, the (Cagan, 1956) model also implies a relationship between real balances and the growth rate of the money supply. As such, we tested for the existence of a structural break in this relationship as well. Our test identified two structural breaks in the relationship between real balances and the growth rate of the *assignat*: May 30, 1795, and another on October 23, 1795. The test statistic is significant at the 99% level, with a similarly tight confidence interval around the estimated break dates, which occur 10 days earlier when using the growth rate of the *assignat*. Note that since both time series have a frequency of 10 days, this difference is not as significant as it seems.

Table 2 reports the summary statistics for real balances, inflation, and the growth rate of the *assignats* for each of the three periods our structural break test identified.[38] Between May 10, 1794, and June 9, 1795, inflation averaged roughly 4.6% every 10 days while the growth rate of the *assignats* averaged 1.5%. Both inflation and the growth rate of the *assignats* increased substantially during the period running from June 19, 1795, through November 2, 1795, averaging roughly 13% and 4.5% every 10 days, respectively. After the establishment of the Directory in November 1795, however, both inflation and the growth rate of the *assignats* decreased, averaging roughly 7% and 2.5%. Finally, average real balances declined in both the second and third periods.

The effects of the structural breaks on the relationship between real balances and inflation can be seen visually. Fig. 4 is a scatter plot of inflation and real balances broken down by the three periods.[39] The visual evidence confirms an inverse relationship between real balances and inflation until early November 1795. After that point, however, the relationship appears to have broken down as the quantity of real balances varied little, despite substantial fluctuations in the inflation rate during this period.

The estimated break dates correspond with fluctuations in the exchange rate between the *assignat* and international specie using daily data. As Fig. 5 illustrates, the *assignat* depreciated substantially within our estimated confidence intervals. Note also that the depreciation of the *assignats* during the second structural break was more pronounced in Paris than in provincial towns such as Marseilles, which, given information costs, is what we should expect if the events generating the structural break originated in the capital.

[38] Note that the summary statistics for the growth rate of the *assignats* corresponds to the three periods identified by the structural break test on the relationship between real balances and inflation rather than the test on the relationship between real balances and the growth rate of the *assignats*. Summary statistics using the periods identified by the structural break test on the relationship between real balances and the growth rate of the *assignats* are available upon request.

[39] See Figure 10 in Appendix D for a similar scatter plot of inflation and the growth rate of the *assignats*. Both figures exhibit roughly the same pattern.

Table 2
Summary statistics by period.

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
	May 10 1794 to Jun 9, 1795				
$m_t - p_t$	39	21.16	0.33	20.25	21.48
Δp_t	39	0.05	0.05	0	0.19
Δm_t	38	0.01	0.01	0.00	0.04
	Jun 19, 1795 to Nov 2, 1795				
$m_t - p_t$	15	19.75	0.27	19.00	20.01
Δp_t	15	0.13	0.13	−0.07	0.41
Δm_t	15	0.05	0.01	0.03	0.08
	Nov 12, 1795 to May 10, 1796				
$m_t - p_t$	21	18.68	0.22	18.06	18.95
Δp_t	21	0.07	0.13	−0.16	0.36
Δm_t	22	0.02	0.04	−0.02	0.15

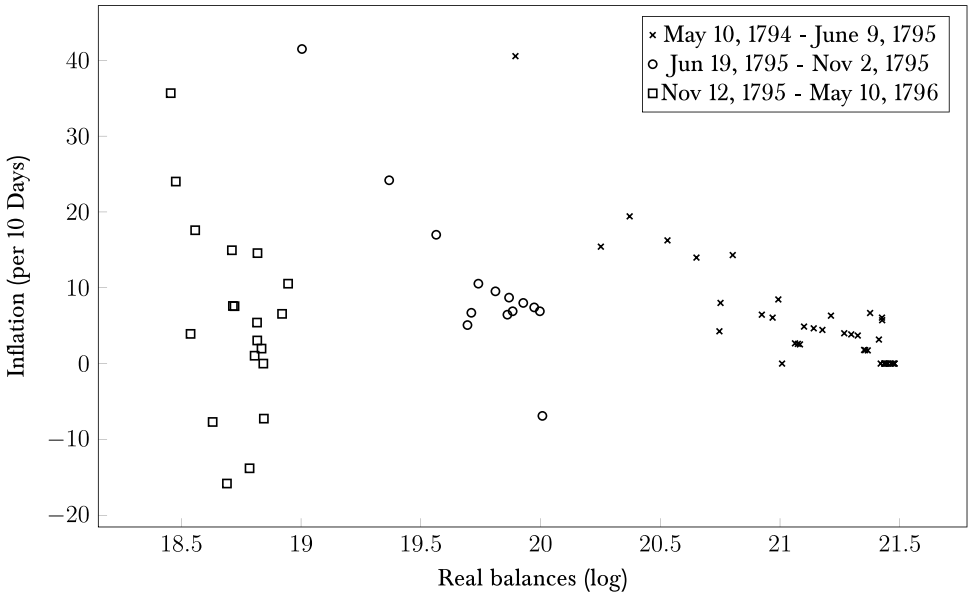

Fig. 4. Real balances and inflation by period.
Source: Caron (1909) and de Nogaret (1800).

Movements in the bond market also correspond with the second estimated break date of November 2, 1795. Fig. 6 shows the market price for a perpetual bond yielding an annuity of 100 pounds.[40] The seven-fold increase in the nominal price of perpetual bonds between October 28 and November 4, 1795, is within our estimated confidence interval. This movement in bond prices is consistent with the idea that people perceived the French government as prioritizing its other liabilities (bonds) over the *assignats*. Hence the devaluation of the *assignats* during that period likely had more to do with the fastly eroding government's credibility to retire currency from circulation and less with a shock to the present value of future primary surpluses.

Evidence from the foreign exchange and bond markets suggests that the structural breaks correspond with radical changes in people's expectations vis-à-vis the government's policy toward the *assignat*. The substantial increase in the *assignat* price of international specie suggests that the events occurring around the time of the structural breaks weakened the asset backing of the *assignat*, resulting in lower demand for the revolutionary currency. Likewise, the increased price of perpetual bonds corresponding with the second structural break points to a shift in bondholders' expectations about the probability of being repaid in specie. More specifically, it suggests that they expected the government to default on the *assignat* to repay the bondholders.[41]

[40] Those *inscriptions* refer to the consolidation of the public debt in 1792, which led all the contracts of the creditors of the state into an inscription in a great book, which was called the "Great Book of the Public Debt". This reform transformed different claims into perpetual annuities yielding the same interest rate (Thiers, 1845).

[41] Calomiris (1988) has made a similar point regarding the Continental government's decision to default on the continental currency following the American Revolution to preserve the newly-formed government's credit in international bond markets. The French government defaulted on two-thirds of its debt in 1797 after a successful coup d'état in September of that year.

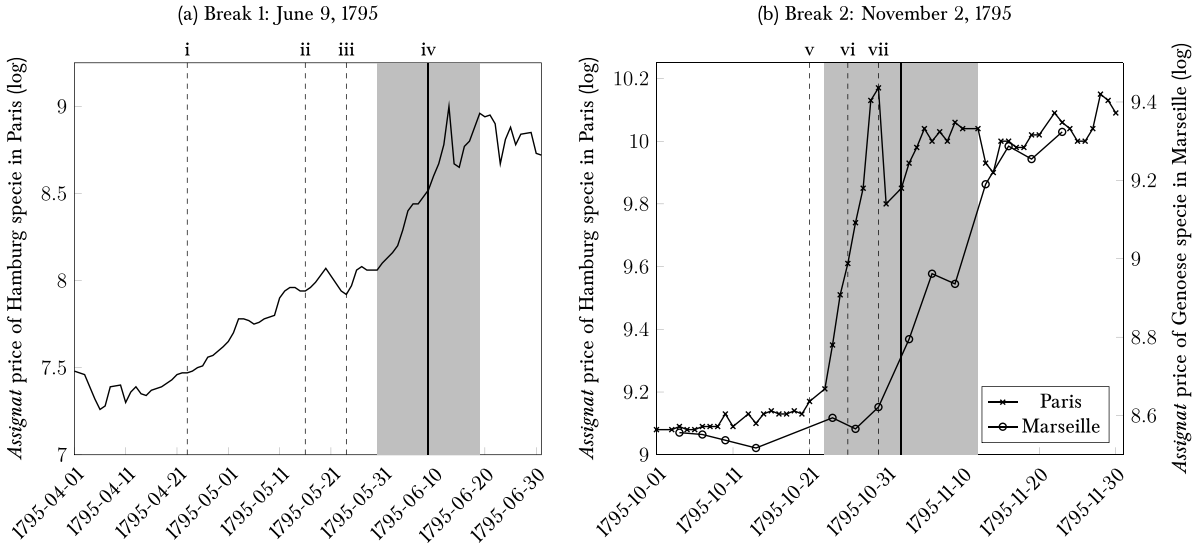

Fig. 5. *Assignat* price of specie.
Notes: The solid vertical lines on each chart denote the estimated break dates and the gray areas illustrate their associated confidence intervals. The dashed lines denote important political events that affected the fiscal backing of the *assignat*: (i) Commission of the 11 created; (ii) Royal *assignats* demonetized; (iii) *Montagnard* insurrection; (iv) Restoration of property to the widows and heirs of victims of the Terror; (v) New legislative elected; (vi) End of Convention; (vii) New Congress in Session. See Table 7 in Appendix B for additional details. Note that the law restoring expropriated property was passed the same day as the first structural break in the relationship between real balances and inflation.
Source: Bouchary (1937) and *Journal de Marseilles*.

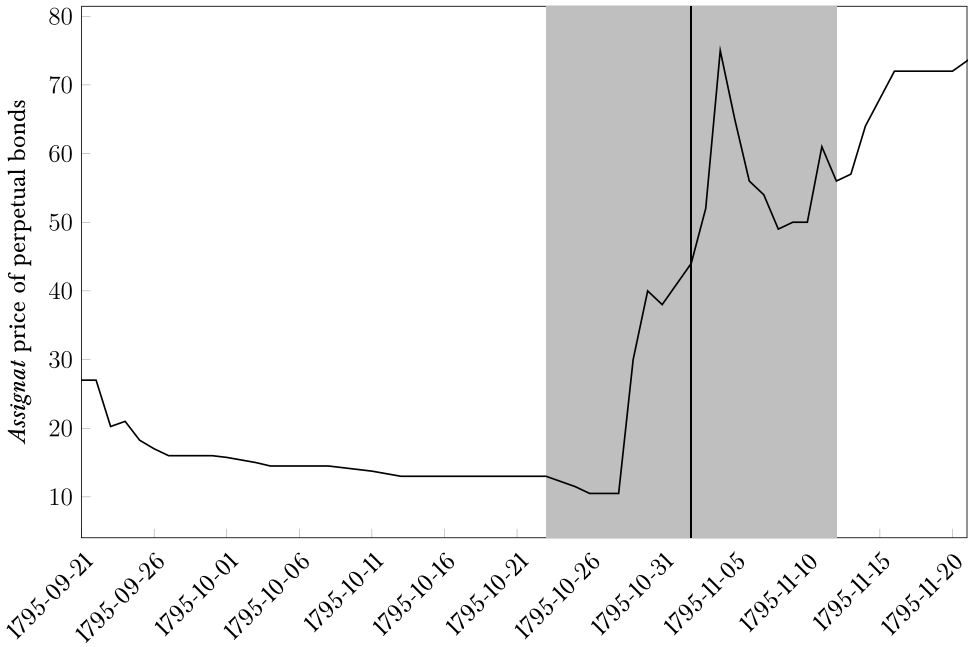

Fig. 6. The price of perpetual bonds and the establishment of the directory
Notes: The gray area illustrates the confidence interval estimated by our structural break tests. The vertical line reflects the estimated break date of November 2, 1795.
Source: Le Moniteur Universel.

Both structural breaks occurred around the same time as political events that weakened the asset backing of the *assignats*. The first structural break corresponds to the failed *Montagnard* insurrection at the end of May 1795 (see Appendix B for additional details). The *Jacobins* and their most radical members, the *Montagnards*, were the *assignats'* primary proponents in the Convention.[42] A riot on April 1, 1795, had already failed and weakened the *Montagnards*, some of whom were subsequently arrested. As the political influence of the *Jacobins* weakened, a "commission of the 11" was created to draft a new constitution.

The *Jacobins* nonetheless remained influential until the failure of their insurrection on May 20 to 23, 1795. The disarmament of their members in Paris "could lead the way to a new politics" *vis-á-vis* finances and the *assignats* (Crouzet, 1993, p. 386). This insurrection was far from benign. Indeed, it almost succeeded. The Parisian *sans-culottes* killed a member of parliament and presented his head on a spike to the president of the Convention. The government took three days and 40,000 soldiers to disarm 60,000 Parisian rioters equipped with guns and canons and protected behind barricades.[43] One consequence of this failed insurrection was the weakening of the political support for the *assignats* and, thus, their asset backing.

Starting in February 1792, the revolutionaries had decided to seize the possessions of those emigrating "so as to ensure that the Nation receives the indemnity that is owed to it, for the extraordinary costs occasioned by the conduct of the émigrés". (Steinberg, 2019, p. 68). These national assets of second origins were part of the asset backing of the *assignats*, meaning that their sales led the government to retire *assignats* from circulation. During the Reign of Terror, the government added to these national assets by confiscating the properties of those government officials deemed counter-revolutionaries. This is what led d'Ivernois (1795, p. 4–5) to argue that "Each assignat issued was then nothing but sort of bill of exchange drawn on the Revolutionary Tribunal, and paid by the Guillotine".

Soon after the *Montagnards*' loss of influence after the May 1795 insurrection, the Convention adopted a law regulating the restoration of property to the widows and heirs of victims of the Terror.[44] In the debates leading to that law, some parliamentarians warned against the destabilizing effects of this decision on the *assignats*. Suspending the sale of those national assets could easily be read as the first step in repudiating the asset backing of the *assignats*. This measure, Lecointre claimed, had already resulted in a sharp depreciation of the revolutionary currency: "If you take one retrogressive step in this matter, what will become of public trust? What will become of our finances? If you look back even once on the matter of these possessions, you will give the government an incalculable shock".[45]

Another member of the Convention, Pierre Guyomar, was even more explicit: "Restoring the possessions of the condemned, this actually means a general amnesty. For, among the condemned, there are émigrés, there are squanderers of public funds. Shall we restore the property of the Duke of Orléans? Shall we restore to Robespierre, to Hanriot, to the conspiratorial commune of Lyon?"[46] The problem was that the restitution of national assets left the door open for subsequent reparations. Once the government started on this path, it was difficult for people to know how secure buying national assets would be.

The failed *Montagnard* coup of May 1795 increased the prospects of a new constitution being enacted. As the Parisian police report on June 15, 1795, "what mainly occupies minds [...] is the expectation of the new government, whose mode must be soon proposed". (Aulard, 1899, p. 15). However, one growing worry was that the government would default on the *assignats*. For instance, on June 17, 1795, a police report reads: "Dufresnoy says he heard several individuals say they were not surprised at the loss the *assignats*, since during the course of next month France was to have a chief, and bankruptcy would be declared" (Aulard, 1899, p. 20). Similarly, On June 13, 1795, a police agent reports that he heard in a coffee shop that "the project of the Convention was to demonetize the *assignats* of ten thousand and five hundred pounds and that people added that several members of parliament did not hesitate to say in their societies that there was no other way to bring in seven or eight billion of *assignats* on the fifteen which are circulating". (Aulard, 1899, p. 12).

The second structural break we identified corresponds with the establishment of the Directory. This break can be explained by both the weakening of the *Jacobin* left, which strongly opposed the demonetization of the *assignats* (Lefebvre, 1977, p. 104), and by the political success of the Royalists in the elections of October 1795.[47] As long as the *Jacobins* remained a major political force, demonetization was out of the question. On the other hand, the Directorial regime was eager to return to a metallic currency, even if it was at the expense of the *assignats* holders. The new lower chamber, the *Conseil des Cinq-Cents*, was not as committed to avoiding a de facto default on the *assignats* (Levasseur, 1903, p. 126). The political successes of the Royalists, who won well over 50% of the one-third of seats subject to regular elections, increased the prospects that the national assets of second origins—and maybe even those of the clergy—would be returned. As before, this meant weakening the asset backing of the *assignats*.

The successful establishment of the Directory was far from certain, even in the first days of its existence. As Director de La Révelliére-Lépeaux (1895, pp. 257–263) explains in his memoirs, an attempted coup by the monarchists gave some *Jacobins* an excuse to stop the establishment of the Directory and to reestablish the Revolutionary government. A secret agent reports that on October 24, two days before the official start of the Directorial regime, some people in Paris "manifested the fear that the

[42] The National Convention was the national legislature ruling France before the establishment of the Directory in November 1795. As Lefebvre (1964, p. 107) writes: "Cambon, the Montagnards and the Thermidorians who had remained Republicans [...] repudiated [demonetization], so that it became the bone of contention between the parties, and *could not triumph until the Left had been finally crushed*". [emphasis added].

[43] *Le Courrier Républicain*, n°565, May 23, 1795.

[44] The law was passed on June 9. *Le Moniteur Universel*, n°264, June 12, 1795.

[45] *Le Moniteur Universel*, n°85, December 15, 1794.

[46] *Le Moniteur Universel*, n°226, May 5, 1795.

[47] Appendix C presents evidence from parliamentary debates that suggest the establishment of the Directory did weaken the political Left and thus made demonetization more likely.

work of the Convention would continue beyond the 5th of this month [Brumaire], which would further delay the organization of the constitutional government". (Aulard, 1899, p. 335). During the Convention's last weeks, leading politicians worried that skyrocketing inflation would lead to a coup where their heads could quite literally be lost. The president of the Committee of Public Safety, Cambacérès, declared during a session of the Committee of Public Safety that if inflation continues "well, we run the risk of being hooked to the lantern".[48] "Assignat or death" was not simply a rhetorical trick but a grim possibility for those politicians.

Even after the official start of the regime, the threat of a *Jacobin* coup remained acute (Lefebvre, 1977), and Director (de La Révelliére-Lépeaux, 1895) remembered being seized with "mortal anguish" during the first few days of the Directory. The remaining *Jacobins* in the Directorial Congress, such as Dubois-Crancé or Lindet, fiercely defended the interests of the bearers of *assignats* by opposing their demonetization (Crouzet, 1993; Lefebvre, 1977; Antonetti, 2007). However, their influence was now too limited to determine the course of monetary policy, and the Directors "were decided to abandon the assignats" (Crouzet, 1993, p. 399). The attitude of the new regime toward the *assignats* can be best summarized by the following exchange, on October 25, 1795, one day before the end of the Convention, between Rewbell, future Director, i.e., a member of the executive branch in the Directory, and left-wing politicians in the parliament:

> *Rewbell.* [...] your system of assignats is so bad that it can no longer continue. (whispers).
>
> *Vallée*. Are we here organizing the counter-revolution? (whispers on the left).
>
> (*Le Moniteur Universel*, nº42, November 4, 1795)

On October 31, 1795, one day after the Directorial Congress was constituted, the *Conseil des Cinq-Cents* immediately ordered a report to be written on how to reform monetary affairs. The report, directed by Eschassériaux, was presented in front of the parliament on November 13, 1795.[49] Eschassériaux' project was to limit the ability of the government to inflate the currency. He asked for the quantity of *assignats* to be made public (T1, art.1), to limit the total supply of *assignats* permanently to 30 billion pounds (T1, art. 3), to break the printing press on January 5, 1796 (T.1, art.2) and to convert the *assignats* into what would have been devalued bonds (T.2, art.1). Eschassériaux also complained that the depreciation of the *assignats* "made tax revenue almost null". Hence, Eschassériaux' commission proposed to fix taxes in gold and accept either gold or *assignats* at its market price to pay them.[50]

Eschassériaux' plan to go back to metallic currency was tantamount to a de facto default on the *assignats*, which would have lost their legal tender status. The left wing of the political spectrum fought back. Dubois-Crancé argued that the choice was between "assignats or death", while Lindet argued that demonetization was no different from bankruptcy.[51] Although the *Conseil des Anciens* voted against Eschassériaux' plan on December 5, the worry that the *assignats* would soon be demonetized became pervasive. On November 13, 1795, a secret agent reported people "fear that the assignats will be demonetized" (Aulard, 1899, p. 382). Similarly, on November 15, 1795, another police report claims that some people "pretend that assignats of less than 100 pounds are going to be demonetized" (Aulard, 1899, p. 388), and another, the same day, warns that the public sees the *assignats* "annihilation as proximate" (Aulard, 1899, p. 389). This worry was likely reinforced by the new regime's decision to halt the sale of national assets on November 21, 1795, (Bodinier, 1999).[52]

5.2. Stationarity and cointegration tests

Recall from Section 3 that the necessary conditions for the applicability of the Cagan model of money demand during hyperinflation require real balances and inflation to both be $I(1)$ and cointegrated. To test whether each series is stationary, we applied augmented Dickey–Fuller tests to the entire sample and each period identified by the structural break tests. In the case of the full sample, the two series are integrated of different orders and thus cannot be cointegrated. In the case of the first period, each series is $I(2)$, while in the second, they are integrated of different orders. Finally, in the case of the last period, both series are $I(0)$.[53]

While real balances and inflation fail to meet the necessary conditions for the applicability of the Cagan model for the first and second periods individually, the two series are $I(1)$ when we combine the first and second periods. Table 3 reports the results of the augmented Dickey–Fuller tests. Given the evidence of a structural break in the combined sample, we used the cointegration tests proposed by Gregory et al. (1996), which accounts for a single structural break and provides an estimated break date. Table 4 reports our results. We find that real balances and inflation are cointegrated across the first and second periods despite a structural break. Moreover, our results corroborate the break dates identified by the (Bai and Perron, 1998, 2003) structural break test (see Table 1).

[48] During the Revolution, mobs used lamp posts for improvised lynchings and executions in Paris.

[49] Eschassériaux would continue to be influential on the Directory's financial policies in the following years. He was, in particular, a proponent of free banking, which would prevail for a few years after 1797 (Rouanet, 2021).

[50] *Le Moniteur Universel*, November 24 1795, n6, p. 51

[51] Thomas Lindet was one major politician on the Left who relentlessly defended the *assignats*. Lindet (1795) accused his colleagues of having discredited the *assignats* by weakening their commitment toward them.

[52] The sales of national assets started again in Spring 1796.

[53] Results for the discussion in this paragraph are available upon request.

Table 3
Unit Root Tests.

Variable	Test Statistic	Order of Integration
	May 10, 1794–Oct 23, 1795	
$m_t - p_t$	−3.04** {1}	I(1)
Δp_t	−4.39*** {3}	I(1)
	May 10, 1794–Oct 13, 1795	
$m_t - p_t$	−3.32** {1}	I(1)
Δm_t	−5.28*** {1}	I(1)
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$		

Notes: We estimated these test statistics using the augmented Dickey–Fuller test. To account autocorrelation in the residual, we used the Akaike Information Criterion to select the appropriate lag for each variable. Lags are reported in brackets.

Table 4
Cointegration tests in the presence of a single structural break.

Relationship Tested	Test Type	Test Statistic	Estimated Break Date
	ADF	−4.81*	June 19, 1795
$m_t - p_t$ and Δp_t	Z_t	−6.97***	June 9, 1795
	Z_a	−51.16**	June 9, 1795
	ADF	−4.69*	June 29, 1795
$m_t - p_t$ and Δm_t	Z_t	−4.74*	June 29, 1795
	Z_a	−32.33	June 29, 1795
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$			

Notes: Test statistics reflect the existence of a structural break in both the constant and the slope for both relationships. For all three series, the sample runs from May 10, 1794 to October 23, 1795.

We conducted similar tests on the growth rate of the *assignats* to determine whether changes in the growth rate of the assignat or self-fulfilling expectations were driving changes in the price level. We found that the two series were integrated of different orders over the entire period and during the first and second periods individually. Likewise, while we found that real balances and the growth rate of the *assignats* are first difference stationary, the two series are not cointegrated.[54] Combining the first and second periods, however, overcomes these issues as it did before. During the first and second periods together, both real balances and the growth rate of the *assignats* are $I(1)$ and cointegrated (see Tables 3 and 4). In this case, the break date is a month later than that identified by the (Bai and Perron, 1998, 2003) test. Nonetheless, these results rule out the possibility of a rational bubble in the price level and permit us to estimate the relationship between real balances and the growth rate of the *assignats*.

5.3. Estimating demand for the assignats

We now turn to estimate Eq. (5) using three different estimation procedures. The first procedure is an ordinary least squares (OLS) regression with the inclusion of a dummy variable that we set to 1 for all observations after June 9, 1795.[55] Table 5 reports the results of this regression. Our estimate of the semi-elasticity parameter has the right sign, is statistically significant at the 1% level, and implies a seigniorage-maximizing rate of 25.51% per 10 days. The constant term is also statistically significant at the 1% level, which, together with our estimate of the semi-elasticity parameter, implies a maximum annual seigniorage revenue of 6.4 billion pounds before the structural break in early June 1795.[56] The coefficient on the dummy variable for the structural break on June 9, 1795, is negative and statistically significant at the 1% level, confirming our conjecture that the political upheaval in early June 1795 weakened the asset backing of the *assignats*. Our results indicate that the events surrounding the structural break caused real balances to decrease by roughly 70%, reducing the maximum annual seigniorage revenue that could be sustained from 6.4 billion to 1.9 billion pounds (in specie).[57]

The estimates of the maximum annual seigniorage revenue using OLS seem unrealistic as Toutain's (1987) GDP estimate for the 1781–1790 decade is equal to 5,941 million pounds. For comparison, during a war against Europe, the French government spent 914 million pounds (in specie) in 1792 and 1.33 billion in 1793 before spending decreased to 922 million in 1794 (Rouanet, 2023).

[54] Results available upon request.

[55] See Taylor (1991) for a detailed explanation of the conditions under which OLS can be used to estimate a Cagan-style money demand function.

[56] The seigniorage maximizing rate of inflation that can be sustained in the steady state depends solely on the semi-elasticity parameter, while the maximum amount of annual seigniorage revenue that can be sustained in the steady state depends on the semi-elasticity parameter and the constant term. In the case of the (Cagan, 1956) model, it can be shown that the seigniorage-maximizing rate of inflation occurs where $\Delta p_t = \frac{1}{\alpha}$, where α is the semi-elasticity parameter. It can also be shown that the maximum amount of seigniorage revenue that can be collected in the steady state is equal to $\frac{e^{\psi}}{\alpha e}$, where e is the exponential function, ψ is the constant term, and α is the semi-elasticity parameter.

[57] The coefficient estimate on the dummy variable can be converted into a percent change using the following formula: $100\times(e^{x}-1)$, where x is the coefficient estimate on the dummy variable.

Table 5
Estimating the demand for *assignats* using the inflation rate.

	May 10, 1794–Oct 23, 1795			*Nov 2, 1795-May 10, 1796*
	OLS	DOLS	VECM	OLS
Inflation	−3.92***	−7.04***	−19.13***	−0.14
	(0.42)	(0.57)	(1.80)	(0.35)
Structural Break (June 9, 1795)	−1.21***	−0.96***	−0.90***	–
	(0.07)	(0.07)	(0.07)	(–)
Constant	21.35***	21.48***	21.76	18.76***
	(0.06)	(0.03)	(–)	(0.03)
Observations	53	48	51	20
R-squared	0.93	0.98	–	0.02
Seigniorage-Maximizing Inflation Rate (per 10 days)	25.51%	14.21%	5.23%	–
Maximum Annual Revenue before June 9, 1795	6.4 billion	4.06 billion	1.99 billion	–
Maximum Annual Revenue after June 9, 1795	1.9 billion	1.55 billion	0.81 billion	–

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Notes: The constant and slope coefficient estimates obtained from the dynamic ordinary least squares (DOLS) regression assume four leads and lags. We obtained similar parameter estimates using alternative leads and lags. Our results are available upon request. The standard errors associated with our OLS and DOLS estimates are corrected for fourth and first order autocorrelation in the residual, respectively, and computed using the Newey–West estimate of the error variance. The constant and slope coefficient estimates obtained using the vector error correction model (VECM) assume 2 lags. Parameter estimates derived from alternative lag structures are available upon request.

While our estimate of the semi-elasticity parameter is super consistent using OLS in the sense of Stock (1987), inflation is unlikely to be strictly exogenous. To account for this possibility, we use the dynamic ordinary least squares (DOLS) approach proposed by Stock and Watson (1993) to generate a lags and leads estimator of the semi-elasticity parameter.[58] Table 5 reports the results of this regression. As before, the semi-elasticity parameter has the right sign and is statistically significant at the 1% level. However, the estimate is smaller than that yielded by OLS, implying a lower seigniorage-maximizing inflation rate of 14.21% per 10 days. The constant term is again statistically significant at the 1% level and, when combined with the semi-elasticity estimate, implies a maximum annual seigniorage revenue of 4.06 billion pounds—roughly two-thirds of GDP—before the first structural break. The coefficient estimate on our dummy variable continues to be negative and statistically significant at the 1% level. The estimate implies that the events surrounding the structural break caused real balances to decline by nearly 62% and, consequently, the maximum amount of annual seigniorage that could be collected fell to 1.55 billion pounds or around 26%

For the third procedure, we used a vector error correction model (VECM) to estimate *assignat* demand. The results, which we report in Table 5, are consistent with what we found using OLS and DOLS. However, the estimate of the semi-elasticity parameter is much larger when using the VECM, implying a seigniorage-maximizing rate of inflation of 5.23% per 10 days. The VECM results indicate that before the first structural break, the maximum annual seigniorage that could be raised was roughly 2 billion pounds—33% of GDP, and fell to 0.81 billion pounds after the structural break owing to the roughly 60% decline in real balances. This estimate is consistent with the growing worry after June 1795 that issuing *assignats* could no longer cover current government expenses. Indeed, 0.81 billion was less than real government spending during the previous year, 1794. Since the VECM provides the largest of the three semi-elasticity estimates, we plot the seigniorage-maximizing rate of inflation implied by the estimated semi-elasticity parameter along with average and actual inflation over this period in Fig. 7. The figure illustrates that actual inflation was generally below the seigniorage-maximizing rate until the early spring of 1795. However, average inflation over the entire period exceeds our estimates of the seigniorage-maximizing rate, suggesting that the government may have been on the wrong side of the seigniorage Laffer (or rather "Bailey" 1956) curve.

Finally, while the final period following the establishment of the Directory failed our cointegration tests, we did regress real balances on inflation to show that there is no relationship between the two series during this period. We report these results in the final column of Table 5. Consistent with both the visual evidence from Fig. 4 and our cointegration tests, we find no evidence of a relationship between real balances and inflation after the second structural break on November 2, 1795, suggesting a total lack of liquidity demand for the *assignats* after that point.

Without rational bubbles, the growth rate of the money supply determines the inflation rate one-for-one in stationary equilibrium. Under such conditions, regressing real balances on the inflation rate and the growth rate of the money supply should yield the same estimates.[59] To determine the extent to which this implication holds, we use the same procedures as before, using the growth rate of the *assignats* as the dependent variable. Table 6 reports our results. The parameter estimates on the growth rate of the *assignats* using OLS and DOLS are much larger than those we found using inflation as the dependent variable. Nonetheless, the estimates have the right sign, are statistically significant at the 1% level, and are close in magnitude to our VECM estimates. Likewise, the coefficients

[58] Ireland (2009) used this approach to estimate the demand for money under normal conditions, and Pittaluga et al. (2020) have used it to do the same during periods of high inflation.

[59] Engsted (1993, 1998) used this approach to determine whether changes in the money supply or self-fulfilling expectations drive price-level movements. See also: Funke et al. (1994).

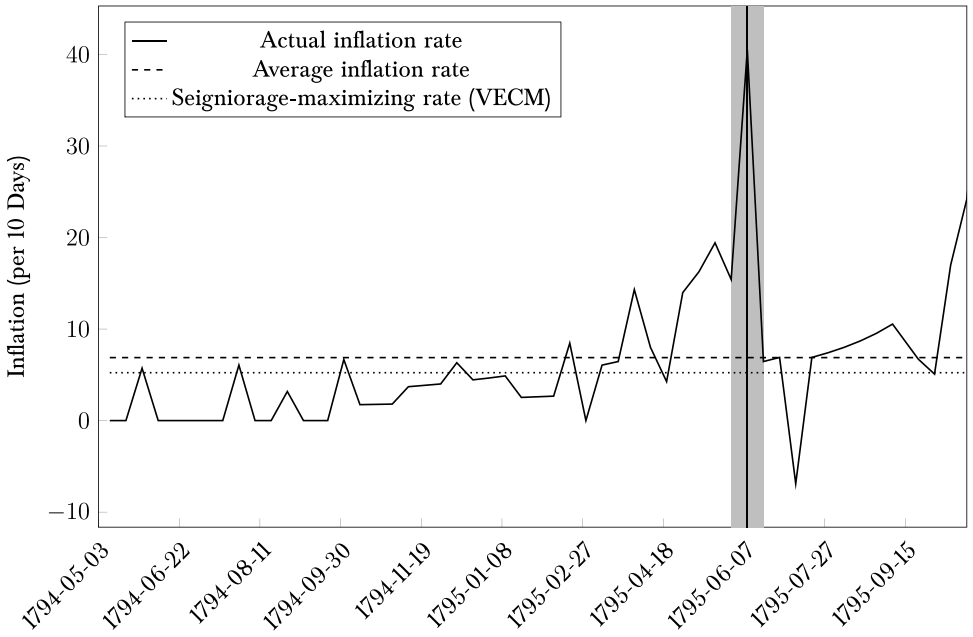

Fig. 7. Inflation and the seigniorage maximizing inflation rate.

Table 6
Estimating the demand for *assignats* using the growth rate of the *assignats*.

	May 10, 1794–Oct 13, 1795			*Oct 23, 1795-May 10, 1796*
	OLS	DOLS	VECM	OLS
Growth Rate of the *Assignats*	−15.45**	−21.02***	−14.15***	1.39
	(5.90)	(3.93)	(2.06)	(1.02)
Structural Break (May 30, 1795)	−0.85***	−0.78***	−1.05***	–
	(0.21)	(0.18)	(0.08)	(–)
Constant	21.39***	21.52***	21.52	18.73***
	(0.09)	(0.06)	(–)	(0.06)
Observations	51	46	48	21
R-squared	0.88	0.97	–	0.08
Seigniorage-Maximizing Growth Rate (per 10 days)	6.47%	4.76%	7.06%	–
Maximum Annual Revenue (1st period)	1.69 billion	1.42 billion	2.10 billion	–
Maximum Annual Revenue (2nd period)	0.70 billion	0.63 billion	0.71 billion	–

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Notes: The constant and slope coefficient estimates obtained from the dynamic ordinary least squares (DOLS) regression assume four leads and lags. We obtained similar parameter estimates using alternative leads and lags. Our results are available upon request. The standard errors associated with our OLS and DOLS estimates are corrected for third-order autocorrelation in the residual and computed using the Newey–West estimate of the error variance. The constant and slope coefficient estimates obtained using the vector error correction model (VECM) assume 3 lags. Parameter estimates derived from alternative lag structures are available upon request.

on the dummy variable are statistically significant at the 1% level and are negative, indicating that the weakening of the *assignat's* asset backing reduced *assignat* demand. The parameter estimate produced by the VECM is statistically significant at the 1% level and somewhat less than what we estimated using inflation as the independent variable. The results again indicate a negative money demand shock at the structural break. Finally, as before, we regressed real balances on the growth rate of the *assignats* during the third period and again found no evidence of a relationship between the two series.[60] Overall, the results in Table 6 suggest that printing *assignats* may no longer have been sufficient to finance government spending.[61]

While data limitations prevent us from estimating the second structural break's effect on the demand for *assignats*, we can illustrate the magnitude of this effect by constructing a simple counterfactual. To do so, we use the actual inflation rate and growth

[60] See Figure 10 in Appendix D for a scatter plot of real balances and the growth rate of the *assignats*. Similar to 4, there is no discernible relationship between the two series during the third period.

[61] These results align with Nicolini's (1996) theoretical insight that speculative hyperinflations will not be observed in equilibrium provided a currency has sufficient asset backing.

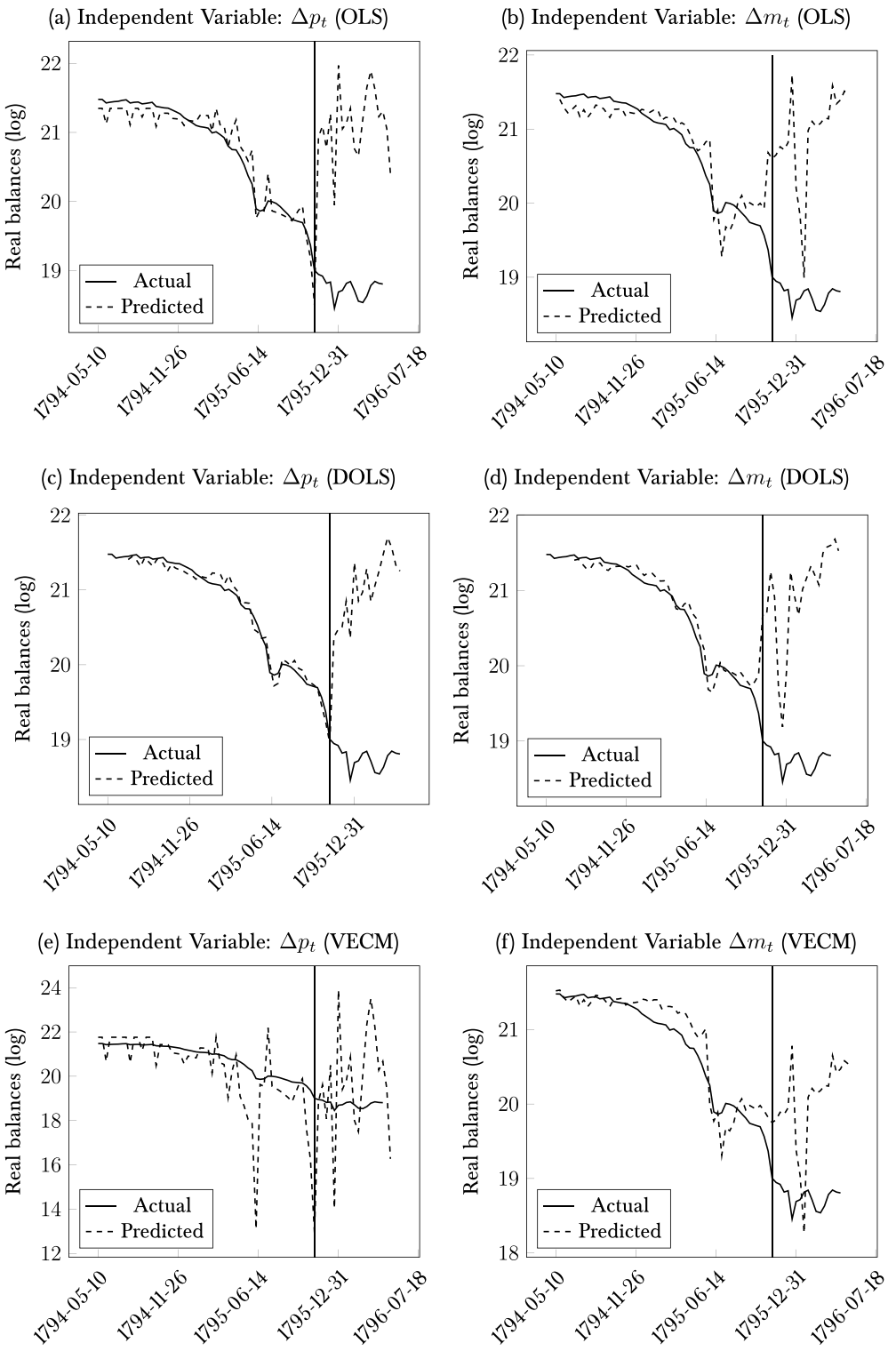

Fig. 8. Predicted versus actual values of real balances.
Notes: The solid vertical lines on each chart denote the second structural break on November 2, 1795.

rate of the *assignats* during the third period and the parameter estimates derived from our empirical analysis to illustrate how real balances would have responded to the actual rates of inflation and money supply growth during the final period. Fig. 8 illustrates the difference between the actual path of real balances and our estimates' implied paths.

The OLS and DOLS results illustrate that our estimates closely track the actual path of real balances before the third period and then diverge substantially after the establishment of the Directory. This divergence suggests that the impending demonetization of the *assignats* significantly decreased real balances. The VECM results are less clear, especially when using the inflation rate. This evidence should be interpreted cautiously as it assumes the inflation and money supply process would have remained constant across regimes, which is extremely unlikely. Nonetheless, the visual evidence presented in Fig. 8 does provide some sense of how the establishment of the Directory affected the demand for *assignats*.

6. Conclusion

For over 200 years, scholars have used the *assignat* hyperinflation to advance our understanding of monetary theory. We have contributed to these efforts by examining the political factors that influenced the asset backing of the *assignats* and, thus, the demand for the revolutionary currency. We identified two structural breaks that correspond with the weakening of the *Jacobin* left's control of parliament and the establishment of the Directorial regime. Our results indicate that the failed *Montagnard* insurrection in the spring of 1795 decreased *assignat* demand by up to 70%, decimating the inflationary tax base. Consequently, the maximum amount of seigniorage revenue the *assignat* could produce fell precipitously.

Our results also indicate that the Directory's decision to demonetize the *assignats* caused the relationship between real balances and inflation to break down altogether. The hypothetical counterfactual we constructed using our estimated money demand function for the first two periods suggests that real balances would have been higher, and the *assignat* price of specie lower under the Directorial regime had the revolutionary currency not been demonetized. Finally, our findings are robust with respect to the choice of the estimation procedure and when using the growth rate of the *assignats* instead of the inflation rate as the independent variable—the latter indicating that self-fulfilling expectations did not drive movements in the quantity of real balances and the price level.

As we see the matter, scholars studying inflationary finance need to incorporate the importance that politics plays in the money supply process and the effect that political considerations have on the asset backing of rapidly depreciating currencies. The shifting political equilibrium in revolutionary France weakened the government's commitment to remove the *assignats* from circulation, which significantly affected the demand for the revolutionary currency and, thus, the inflation tax base. Since reliance on inflationary finance and political instability often go hand-in-hand, further study of this relationship seems to be in order. Failing to account for how the monetary regime affects the demand for money will likely result in an incomplete understanding of the dynamics of hyperinflation.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.euroecorev.2023.104510.

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